CASS COUNTY SOILS

SOIL REPORT 71

UNIVERSITY OF ILLINOIS
AGRICULTURAL EXPERIMENT STATION

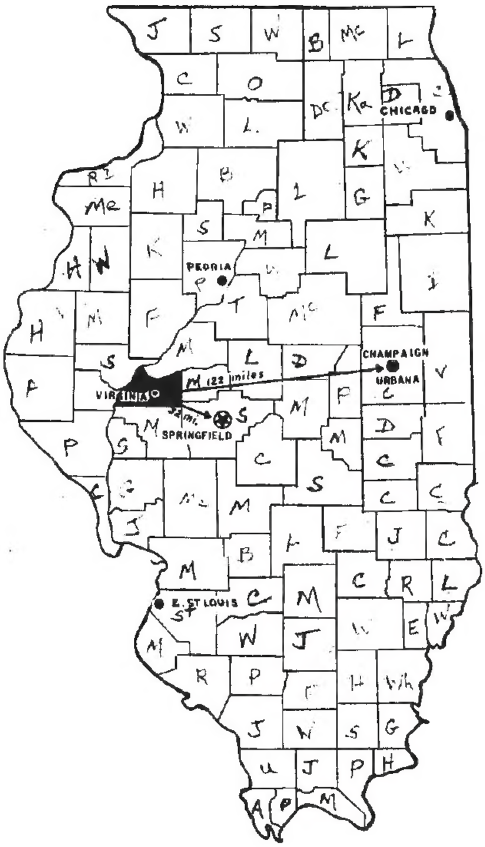
COVER PICTURE

The picture on the cover of this report shows how a small but typical part of Cass county looks from the air. Many will recognize the town in the center as Chandlerville in the northeast part of the county. Sangamon river cuts across the upper left-hand corner of the picture. Route 78 comes down from the north.

Above Chandlerville and for about 18 miles west is some of the most productive land in the county or in the state. This is known as Oakford silt loam, terrace, Type 39. Rough timbered upland borders the bluffs.

Many of the steeper slopes in the southwest quarter of the picture show evidences of erosion. These slopes probably should have stayed in timber. One of the main problems in this county is to keep erosion from doing further damage to farmlands and to what were once good timberlands.

(Picture supplied by
Agricultural Adjustment Administration,
U. S. Department of Agriculture)



Cass county lies in west-central Illinois, bordered on the west by Illinois river and on the north by Sangamon. The county seat, Virginia, is about 32 miles by highway from Springfield, the capital of the state, and 122 miles from Champaign-Urbana.

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Urbana, Illinois January, 1947

CASS COUNTY SOILS

By Guy D. Smith, F. F. Riecken, and R. S. Smith

THIS SOIL REPORT has been written primarily for the farmers of Cass county. The soil map of the county and the descriptions of the different soil types are based on a detailed survey made acre by acre by men trained in the science of soil classification. The recommendations for management are based on long-time field experiments and the experience of good farmers.

Located in the west-central part of Illinois just south of where Sangamon river joins the Illinois, Cass county is mainly agricultural — there are no large cities in it. Virginia is the county seat; Beardstown is the largest town.

About 120,000 acres, or half the land area, is used for cultivated crops. About 17,000 acres of farmland is wooded and about 20,000 acres is in plowable pasture. Flooded bottoms, steep bluffland, and sandy areas make up the rest of the county. Thirty-eight types are mapped and described. Each has its peculiarities. Each requires somewhat different management from most of the others if it is to give the best returns now and in the years to come.

For the farmers and landowners of Cass county this report attempts to answer three major questions: *What crops are adapted to each type of soil? What treatment does each type need? What yields may be expected?*

Scenes of this kind are common in Cass county. Loess bluffs like those in the background rise 150 to 200 feet above the floodplains and terraces of Illinois and Sangamon rivers. Beyond the bluffs stretch the upland prairie and timber soils. Fig. 1

HOW TO KNOW YOUR SOILS AND PLAN THEIR MANAGEMENT

First Examine the Soil Map

Note numbers and names of types. The first step in using this report is to turn to the soil map between pages 24 and 25 and note the numbers or names of the soil types in the area in which you are interested. The map, consisting of two sheets, shows the location and boundaries of the soil types of Cass county. The name of each type is shown in the "legend" on the map. The area of each type is shown both by a distinguishing color and by a number usually placed in each area. Where an area is too small to accommodate the soil number, the number is placed adjacent to the area and connected with it by a line.

Colors are guide to general soil conditions. Various shades of blue are used for the dark upland soils; shades of yellow for the light-colored upland soils; browns for the dark medium- to fine-textured soils developed from bluff wash; reds for the excessively sandy and drouthy soils; purples for soils with slowly permeable subsoils; and greens for first bottom or overflow areas.

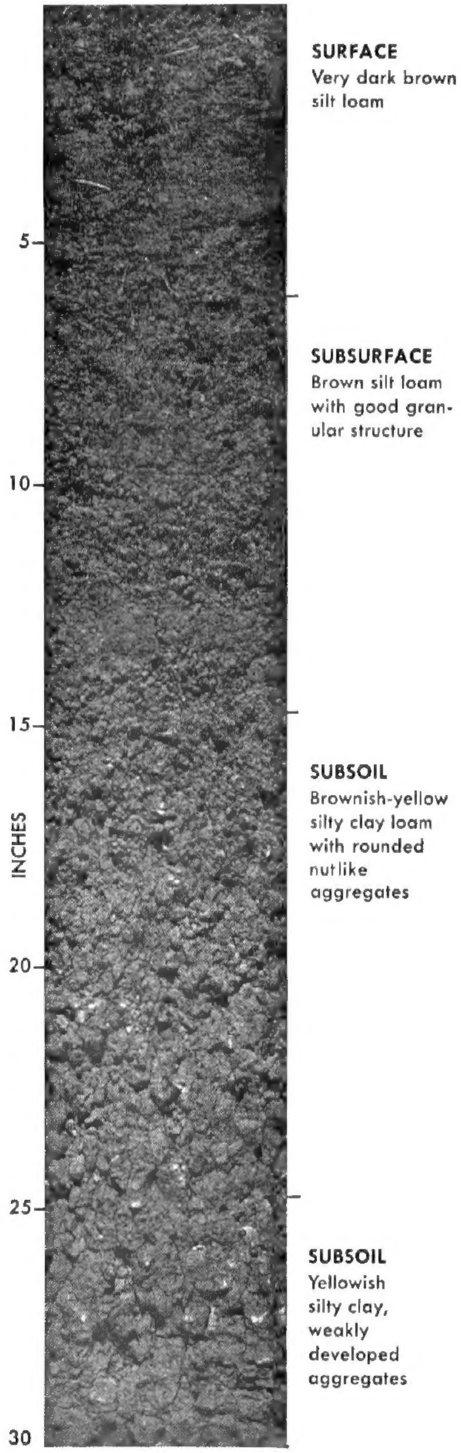
Entire soil profile is important. Soil types are differentiated on the basis of the character of the soil to a depth of 40 inches or more, not on the surface alone. It frequently happens that the surface layer of one type is little or no different from that of another, and yet the two types may differ widely in the character of the subsurface or subsoil and hence in agricultural value. It is of utmost importance, therefore, in studying descriptions of soil types, to get a clear mental picture of *all* the outstanding features of each type, including the various layers you see when you cut down into the soil for 30 or 40 inches.

Fig. 2 shows what Muscatine silt loam looks like to a depth of 30 inches. The surface layer is only about 7 inches thick, but the deeper horizons are permeable to water and easily penetrated by the roots of plants. The high quality of this soil is due as much to the nature of the deeper horizons as to the nature of the surface soil.

Many variations occur within each type. It is likewise important to understand that a given soil may include quite a range in properties. The boundaries between soil types vary in sharpness. Between most soils there is a zone that includes some of the properties of each type. Also, within a given type there are often distinct areas of other types too small to be shown on the soil map. Sometimes types are so intermingled that it is impossible to show them separately. Sylvan and Hamburg silt loams, Types 19 and 35 (shown as 19-35 on the map), and Tallula and Hamburg silt loams (34-35) are two such areas of intermingled types in Cass county. They are indicated in the descriptions as "undifferentiated."

Type differences have definite causes. Soil types do not occur at random, nor is their nature a matter of chance. Their character is determined by a number of factors (see discussion on pages 39 to 42). The kind of situations in which the important upland soil types in Cass county occur is shown in Fig. 3, page 6. While each type is found on areas with certain limits as to slope, more than one type may be found in the same slope range. Difference in natural drainage or in native vegetation may have caused different types to develop.

Thus if you know the conditions under which a given soil type has developed,



Profile of Muscatine silt loam to a depth of 30 inches. Note depth of black surface "horizon" and its fine structure. Fig. 2

you will be able to get from the soil map a picture not only of the present character of the soil but of the slope of the areas where it occurs, the native vegetation that once grew on those areas, the drainage, and other conditions that have affected its formation.

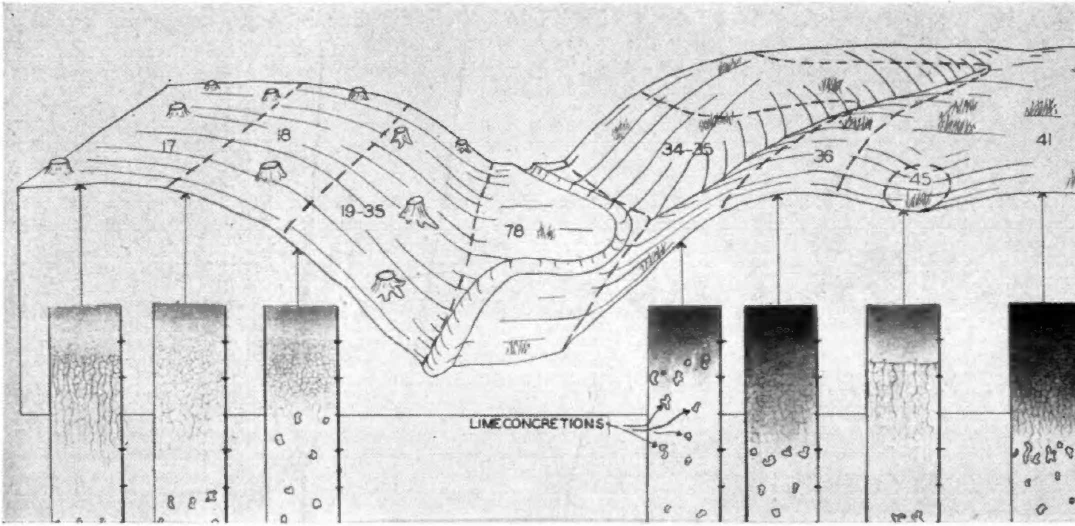
A list of the different soil types in Cass county is given in Table 4, page 16. This table also shows the area of each type in square miles and in acres and the percentage that each constitutes of the total area of the county.

Compare Your Yields With Test Yields

Use five-year averages. In Illinois high crop yields year after year are the result of good soil and good management. Low yields may be caused by a poor soil, or by trying to grow crops that are not adapted to the soil, or by faulty management.

Table 1 on page 7 shows what yields can reasonably be expected from Cass county soils, as an average, over a period of years under good soil management.[1] If you find that your average yields for five years or longer are much below those shown in Table 1 for your soil types, it will pay you to examine your management practices to see where changes should be made. Five years are necessary for a valid comparison because of the wide seasonal variations that occur in rainfall, temperature, wind, and insect and disease injury.

[1] Anyone interested in land as an investment should realize that crop yields alone are not necessarily a true index to land values, for the operating costs necessary to get good yields vary from one type to another. In general, the lower the yields, the more difficult and more costly it is to apply good management practices. On some soils that produce only medium or low yields, good management is rarely found except where the owner himself operates the farm.



Type No.	17	18	19	34	36	45	41
Name	BERWICK SILT LOAM	CLINTON SILT LOAM	SYLVAN SILT LOAM	TALLULA SILT LOAM	TAMA SILT LOAM	DENNY SILT LOAM	MUSCATI[illegible] SILT LOAM
Slope	.5-1.5%	1.5-7%	7-15%	5-15%	3.5-7%	0-.5%	1.5-3.5[illegible]

This diagram shows how the more important upland soil types in Cass county lie with referenc slope, natural vegetation, and original water table. The timbered areas (indicated by the tree s creek bottom; the prairie types (indicated by clumps of grass) are shown to the right. The origi pond at the extreme right.

The rectangles in the foreground (which are on considerably larger scale than the rest of different types. The darker shading shows the soils that have larger amounts of organic matter the arrangement (structure) of the soil particles in the subsoil layers. The average depth to wh the depth of the lime concretions. (*Compare these profile sketches with the photograph of Mus* shown for Type 35, Hamburg silt loam, because it does not show any profile development.

Table 1. — CASS COUNTY SOILS

Average Yields of Crops to Be Expected Over a Period of Years Under Good Management

Good management is defined on pages 9 to 15. Figures in bold face are based upon long-time records kept by farmers in cooperation with the Department of Agricultural Economics; the others are estimated yields.

(Yields obtained without the use of soluble fertilizers[a])

Type No.	Type name	Hybrid corn	Wheat	Oats	Soybeans	Rye	Alfalfa	Bluegrass pasture[b]
		bu.	*bu.*	*bu.*	*bu.*	*bu.*	*tons*	*days*
17	Berwick silt loam	56	21	39	21	24	2.0	70
18	Clinton silt loam	**58**	**23**	**41**	**23**	26	**2.5**	80
19	Sylvan silt loam	N	N	N	N	N	2.0	70
28	Jules silt loam	V	V	V	V	V	N	V
30	Hamburg very fine sandy loam	N	N	N	N	N	N	30
34	Tallula silt loam	60(E)	22(E)	41(E)	N	R	2.6	70
35	Hamburg silt loam	N	N	N	N	N	2.0	60
36	Tama silt loam	**66**(E)	**24**	**46**	**24**(E)	R	**2.8**	80
39	Oakford silt loam	71	26	50	25	R	3.0	90
41	Muscatine silt loam	**73**	**25**	**51**	**26**	R	**3.0**	100
45	Denny silt loam	45	18	35	20	R	N	50
53	Plainfield fine sand, rolling phase	N	N	N	N	15	1.6	N
54	Plainfield sand	N	N	N	N	13	1.5	N
61	Atterberry silt loam	62	23	44	24	R	2.6	80
67	Harpster clay loam	**65**	**21**	**44**	**25**	R	N	90
68	Sable silty clay	**70**	24	**47**	**28**	R	**2.3**	100
71	Beaucoup clay	60(D)	21(D)	39(D)	24(D)	R	N	70
73	Huntsville loam	V	V	V	V	V	N	V
78	Arenzville silt loam	V	V	V	V	V	N	90
80	Alexis silt loam	60(E)	22	41	23(E)	R	2.5	80
81	Littleton silt loam	69	24	47	25	R	2.8	90
83	Sawmill clay	**62**(D)	**22**(D)	**42**(D)	**25**(D)	R	N	80
87	Sumner sandy loam	**46**	**18**	**36**	**15**	**20**	**1.8**	60
88	Hagener loamy sand	**40**	**15**	N	13	**17**	**1.7**	N
103	Muck	66	N	N	24	N	N	60
125	Selma loam	**62**	**22**	**43**	**24**	R	2.1	80
136	Brooklyn silt loam	43	18	32	19	R	N	60
177	Orio silt loam	57	21	37	22	R	1.7	80
184	Clinton fine sandy loam	52	20	36	18	23	2.2	60
186	Sylvan fine sandy loam	N	N	N	N	N	1.7	50
187	Brooklyn sandy loam	38	17	30	17	R	N	50
188	Beardstown loam	**51**	**20**	**36**	**19**	R	1.5	70
195	Hersman clay loam	66	23	42	26	R	N	90
200	Orio sandy loam	**48**	**20**	**34**	**20**	R	N	70
201	Selma sandy loam	**54**	**20**	**36**	**21**	R	N	60
202	Biggs sandy loam	39	20	31	18	R	N	40
203	Kilbourne loamy sand	N	N	N	N	N	N	30
244	Hartsburg silty clay	**69**	**24**	**46**	**27**	R	2.2	90

[a] Letters in parentheses have the following meanings: D=Yields for drainage districts with pumping facilities. E=Crop not adapted unless erosion control measures are used. N=Crop not adapted. R=Crop adapted but rarely grown. V=Yields are variable, depending upon frequency of overflow. [b] Estimated number of days one acre, without soil treatment, will carry one cow.

How to get good yields. Of course, practices that bring the highest yields of one crop, such as corn, will not always give the highest yields of other crops. Since corn is the main cash crop in this county, farmers who have soils that are not too sandy will doubtless wish to point their management practices toward high yields of this important crop. The figures in Table 1 and the recommenda-

tions for managing the various soil types are based on the assumption that they will wish to do this.

Following are the main ways in which the yields listed in Table 1 can be obtained:

1. Use good crop varieties that are adapted to the region.

2. Use a suitable rotation — one that reduces erosion on rolling types and that includes clover at least once every three or four years. See Table 3, pages 11-12, for examples of good rotations.

3. Return barnyard or green manure to the soil in order to maintain a supply of nitrogen and fresh organic matter.

4. Test the soil and then apply limestone, phosphate, or potash, or any combination of these three materials, where needed.

5. Take reasonable care in preparing the seedbed and in choosing the time and rate of planting.

6. Take suitable measures to control weeds, insects, and diseases.[1]

[1] For a more detailed discussion of the effects of cultural practices, see Illinois Bulletin 444, "Farm Practices and Their Effects on Farm Earnings," pages 480 to 510.

If your yields are low, you will probably discover the reason by studying the sections between pages 18 and 38 that describe the use and management of the soil types on your farm. Poor rotations, poor soil treatment, poor cultural practices, or some combination of these factors, may be the cause.

Actual production records are most helpful in making yield comparisons. Unless you have kept yearly records, you are likely to remember the high yields on individual fields or during favorable years and to forget the less outstanding yields.

Still higher yields are possible. Yields could probably be advanced beyond those shown in Table 1 by applying fertilizers in ways not now usually practiced. Soluble phosphates drilled with wheat and certain other small grains will increase yields in many seasons. There is also evidence that mixed fertilizers applied at corn-planting time often will increase corn yields, especially on very productive soils. Thus while yields below those shown in Table 1 probably indicate faulty management, higher yields are not out of the question.

Table 2. — COMPOSITION OF COMMON FARM CROPS

As Grown on the Residues-Limestone Plots on the Aledo Soil Experiment Field

(Averages for 1936 and 1937)

Crop	Nitrogen	Phosphorus	Potassium	Calcium
	lb.	*lb.*	*lb.*	*lb.*
Corn grain, 1 bushel	.80	.17	.22	.01
Corn stover, 1 ton	14.60	2.60	25.60	10.60
Corn cobs, 1 ton	7.00	1.00	8.80	.40
Oat grain, 1 bushel	.54	.11	.15	.03
Oat straw, 1 ton	10.60	2.20	35.60	6.40
Wheat grain, 1 bushel	1.10	.23	.31	.02
Wheat straw, 1 ton	8.60	1.20	20.00	3.80
Soybean seed,[a] 1 bushel	3.60	.36	1.20	.20
Soybean straw, 1 ton	11.40	1.80	10.80	19.00
Soybean hay, 1 ton	48.00	5.60	22.80	19.20
Alfalfa hay,[b] 1 ton	56.40	5.40	40.20	31.00

[a] Average of the 1941 crop at Urbana. [b] Manure-limestone plots.

Since new crop varieties, new cultural practices, and new plant diseases or insect pests may greatly change yield levels in future years, the figures in Table 1 must be regarded of strictly current interest. Revised tables can be obtained from time to time by writing to the Department of Agronomy, Agricultural Experiment Station, *Urbana, Illinois.*

Know What Good Soil Management Means

Practices are similar for many soils. The practices that are basic to good farming on most Illinois soils are outlined here. It is assumed that drainage is good and that the main crop is corn. Further brief recommendations for each soil type in Cass county are given on pages 18 to 38.

Plant foods must be added. No soil will give high yields of grains indefinitely unless certain materials are added to it. The plant foods that go into the production of grain, animals, and animal products must be restored. This is true no matter how productive the soil was when first brought under cultivation. Even alfalfa and soybeans make heavy demands upon the soil nutrients, especially on the calcium (lime) and potassium (potash) supplies, as shown in Table 2. The grain crops, such as wheat and corn, are usually thought of as taking the most out of the soil. But clovers, alfalfa, and soybeans take even more when the hay is sold or the manure made from the hay is not protected from losses.

The Morrow plots on the campus of the University of Illinois are located on soil similar in appearance and in inherent productive capacity to Muscatine silt loam, a common type in Cass county. Records kept since 1887 show that the yields on the plots cropped continuously without soil treatment have steadily declined.

There are soils, of course, from which it is not possible to get high yields and others where it would not be practicable to try. When, for example, the subsoil is dense and impermeable, the plants may be weak because their roots are so restricted. A loose sandy soil holds such a small amount of water that the corn suffers during dry periods.

Nitrogen and organic matter need first attention. When crop yields are not limited by the physical properties of a soil, what are the most important things to do in order to maintain or increase them? For many Cass county soils the answer is to build up the supplies of nitrogen, phosphorus, and potassium.

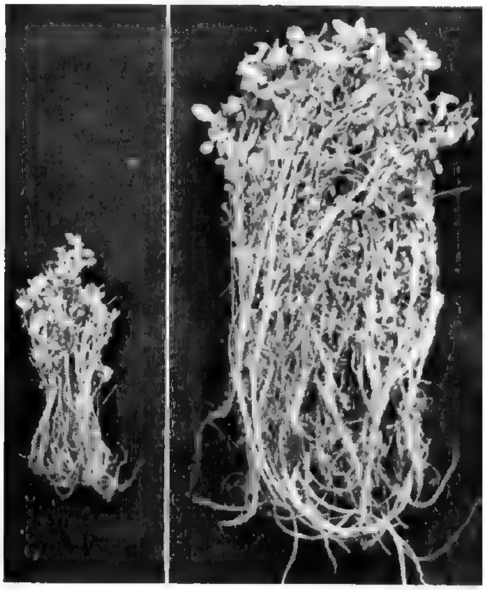
Nitrogen is the plant nutrient most quickly depleted by grain crops. Fortunately a shortage of this element can be corrected by applying animal manures or by plowing under legumes.

Test to see whether soil is acid. If the soil is too acid to grow legumes, the first thing to do is to test each field and apply limestone where it is needed and in the amounts needed. In fact, one of the chief reasons for applying limestone is to get a good growth of inoculated legume crops, since these can be used to supply nitrogen and organic matter. Fig. 4, page 10, shows what 2 tons of limestone did for sweet clover growing on a moderately acid soil.

Instructions for collecting soil samples and making acidity tests are given in Illinois Circular 346, "Test Your Soil for Acidity." Advice on this problem can also be obtained from your county farm adviser.

When a grain system of farming is followed, the best way to keep enough nitrogen in the soil is to grow and plow

under legume catch crops. Sweet clover is a very effective crop for this purpose.[1] Circular 559, "Sweet Clover for Illinois," gives information on the growing of this important crop. Rotations which include enough legumes to maintain a good nitrogen supply in the various soil types of Cass county are given in Table 3.



Sweet clover must have limestone. The plants in the small bundle grew on 4 square feet of unlimed soil; those in the large bundle, on soil given 2 tons of limestone to the acre. Fig. 4

Select a good rotation. Besides providing nitrogen and fresh organic matter, a good rotation also makes it possible to maintain good physical condition in the deeper portions of the soil profile as well as in the surface 6 inches. These deeper levels must be kept porous so water can pass thru them. Deep-rooting legumes help to do this. Too often the physical condition of a soil is judged by the surface soil, whereas the lower levels of the soil must also be considered.

[1] What effect the sweet clover weevil will have on the use of sweet clover for pasture or green manure cannot be predicted at this time.

Not only is it important to adopt a good rotation, it is also important to handle it properly. If all top growth is taken off or grazed closely, much of the value of the rotation, no matter how good, will be lost.

The following four-field cropping system[1] shows a type of rotation that has many advantages for corn-belt farms.

	Field 1	Field 2	Field 3	Field 4
1946.......	Corn	Oats	Wheat (sw. clover)	Alfalfa-brome
1947.......	Oats	Wheat	Corn	Alfalfa-brome
1948.......	Wheat (sw. clover)	Alfalfa-brome	Oats	Corn
1949.......	Corn	Alfalfa-brome	Wheat	Oats
1950.......	Oats	Corn	Alfalfa-brome	Wheat (sw. clover)
1951.......	Wheat	Oats	Alfalfa-brome	Corn
1952.......	Alfalfa-brome	Wheat (sw. clover)	Corn	Oats
1953.......	Alfalfa-brome	Corn	Oats	Wheat

The above system is essentially a four-year rotation. Three years are devoted to cash and feed grains and one year to a deep-rooted perennial legume. Its special advantage is that the alfalfa crops, coming in two successive rotations, follow each other. This arrangement does away with one seeding of alfalfa and brings the sweet clover into the rotation at a good place for it to be used as a green manure. Soil-improving-and-conserving legumes are on one-fourth of the land one year and half the land the next year, or on an average of more than one-third (37½ percent) of the land yearly. The legumes come at times in the rotation when the nitrogen supply in the soil is lowest. The corn crops follow deep-rooting legumes and

[1] This system was worked out by F. C. Bauer, Chief in Soil Fertility.

Table 3. — SUGGESTED ROTATIONS AND TREATM

for Cass County Soils

Type No.	Type name	Treatment materials commonly needed when land is used as suggested[a]	Suggested rotations and types of land use[b]
17	Berwick silt loam	L P	C-O-W-Cl, C-O-Cl, C-SB-O-Cl
18	Clinton silt loam	L P	C-O-W-M-M, C-O-Alf-Alf-Alf-Alf
19	Sylvan silt loam	L P	C-O-Alf-Alf-Alf, Pasture, Timber
28	Jules silt loam	None	C-SB-O-Cl, C-C-O-Cl, C-SB-O(Cl)
30	Hamburg very fine sandy loam	None	Pasture, Timber
34	Tallula silt loam	L P	C-O-W-Cl, C-O-Alf-Alf-Alf, Pasture, Meadow
35	Hamburg silt loam	None	Pasture, Meadow
36	Tama silt loam	L P	C-O-Cl, C-O-W-Cl, (See 4-field system[c])
39	Oakford silt loam	L	(See 4-field system[c])
41	Muscatine silt loam	L	C-C-O-Cl, C-SB-O-Cl, (See 4-field system[c])
45	Denny silt loam	L P	Same as for surrounding areas[d]
53	Plainfield fine sand, rolling phase	L P K	R-Alf-Alf-Alf, Timber
54	Plainfield sand	L P K	R-Alf-Alf-Alf, Timber
61	Atterberry silt loam	L P	C-O-W-Cl, C-O-Cl, (See 4-field system[c])
67	Harpster clay loam	K	Same as for surrounding areas[d]
68	Sable silty clay	L in some areas	C-C-O-Cl, C-SB-C-O-Cl, (See 4-field system[c])
71	Beaucoup clay	None	C-C-O-W-Cl, C-C-SB-W-Cl, Timber
73	Huntsville loam	None	Summer crops
78	Arenzville silt loam	None	Summer crops

(For footnotes and for second section of this table, see next pa

Table 3. — Concluded

Type No.	Type name	Treatment materials commonly needed when land is used as suggested[a]	Suggested rotations and types of land use[b]
80	Alexis silt loam	L P	C-O-Cl, C-O-W-Cl, (See 4-field system[c])
81	Littleton silt loam	L	C-C-O-Cl, C-SB-C-O-Cl
83	Sawmill clay	L in some areas	C-C-W-Cl, SB-W(Cl)-C-O-Cl, Timber
87	Sumner sandy loam	L P	C-SB-R-Cl-W-Cl, C-O(Cl)-W-Cl, Timber
88	Hagener loamy sand	L P K	C-CP-W-Alf, C-SB-R-Cl-W-Cl, Timber
103	Muck	K	Corn, vegetables
125	Selma loam	L K	C-C-O-Cl, C-SB-C-O-Cl
136	Brooklyn silt loam	L P K	C-SB-W-Cl
177	Orio silt loam	L P	Same as for surrounding areas[d]
184	Clinton fine sandy loam	L P K	C-O-W-M-M
186	Sylvan fine sandy loam	L P	Alfalfa, Pasture, Timber
187	Brooklyn sandy loam	L P K	C-O-Cl, SB-O-Cl, SB-W-Cl
188	Beardstown loam	L	C-C-O-Cl, C-SB-O-Cl, C-SB-W-Cl
195	Hersman clay loam	None	C-SB-O-Cl, C-C-W-Cl, (See 4-field system[c])
200	Orio sandy loam	L P K	(See 4-field system[c])
201	Selma sandy loam	K	C-O-W-Cl, (See 4-field system[c])
202	Biggs sandy loam	L P K	C-O-Cl
203	Kilbourne loamy sand	None	Timber
244	Hartsburg silty clay	None	C-SB-O-Cl, C-C-O-Cl, (See 4-field system[c])

[a] L = lime, P = phosphorus, K = potash. Soil tests should be made before these materials are applied. Rec
to areas used for timber.

[b] Key to abbreviations:

C = corn	Alf = alfalfa-grass	CP = cowpeas
O = oats	Cl = clover	SB = soybeans
W = wheat	(Cl) = clover catch crop for green manure	M = mixed clovers and grasses for hay and pasture
R = rye		

[c] See pages 10 and 13.

[d] Areas are too small for separate treatment.

thus benefit from the nitrogen they supply. The alternate seedings of alfalfa and sweet clover cut the cost of seed. Alfalfa can be replaced with some other sod-forming crop such as a mixture of bromegrass and alfalfa.

A four-field cropping system of this kind can be fitted into various situations without sacrificing its main features. It can be adjusted to differences in soil productivity or the tendency of a soil to erode, to different types of farming, to the production of new crops, to changing crop prices, or to hazards of weather, insects, diseases, and weeds. Crop choices and split cropping on one or more fields give the flexibility that is needed for meeting these problems.

Following are eleven other four-field rotations that can be used instead of the corn-oats-wheat-alfalfa rotation chosen for the purpose of illustration. They show further how flexible a four-field rotation is.

Other Four-Field Rotations

1........	Corn	Corn	Oats	Sod
2........	Corn	Oats	Wheat	Sod
3........	Corn	Soybeans	Oats	Sod
4........	Corn	Soybeans	Wheat	Sod
5........	Corn	Corn-soybeans	Oats	Sod
6........	Corn	Oats-soybeans	Wheat	Sod
7........	Corn	Soybeans	Oats-wheat	Sod
8........	Corn	Corn-soybeans	Oats-wheat	Sod
9........	Corn-hemp	Corn	Oats	Sod
10........	Corn	Corn	Oats-flax	Sod
11........	Corn	Soybeans	Oats-wheat	Wheat-clover sod

In Rotations 5 to 11 the fields have been split some years to permit two separate crops to be grown.

Return crop residues and manure. Under a livestock system (a system in which the major portion of the grain and hay grown on the farm is fed to livestock and the manure is returned to the fields) a satisfactory amount of nitrogen can be maintained if a good rotation is used and crop residues are plowed under. Manure and crop residues are very important also in keeping the soil in a good mellow condition and in increasing the rate at which it will absorb water. They may even increase the moisture-holding capacity of sandy soils.

Under a livestock system, however, much valuable plant food will be lost unless the manure is properly handled.[1] The liquid part of manure is very rich in nitrogen and should not be allowed to drain away. Straw bedding used in ample amounts will absorb much of this liquid.

Illinois Circular 465, "Pasture Improvement and Management," and Circular 595, "Manure Is Worth Money — It Deserves Good Care," contain information of value to livestock farmers and will be sent to anyone who requests them.[2]

Test for phosphate and potash. After the need for nitrogen and organic matter has been met, the next step is to test the soil for phosphate and potash. These tests are more complicated than the acidity test. The help of your farm adviser will be needed both in making these tests and in interpreting them.

Keep different plant nutrients in balance. When both phosphate and potash are low, the application of either one by itself gives disappointing results. Even if both these elements are supplied, the results will still be disappointing if there is not enough nitrogen. For best yields of

[1] The subject of farm manure and its care is discussed in detail in U. S. Department of Agriculture Yearbook for 1938, pages 445-461.

[2] All Illinois publications listed in this report are available at the date of the issuance of this report. When they go out of print others of a similar nature are likely to be issued and will be sent in place of those cited.

all crops, all three of these plant foods must be maintained in suitable balance and in adequate amounts.

On fields that are fairly productive, the returning of reasonably large amounts of crop residues and barnyard manure to the soil will keep the available potash at a high enough level for a considerable time. Large applications of manure will also be of great help in keeping up the supply of available phosphate.

Where a grain system of farming is followed, less manure is available than under a livestock system. It is therefore especially important, under grain systems, to watch the soil for shortages of nitrogen, phosphate, and potash.

Because the soils of Cass county vary so greatly in productivity, no general reply can be made to questions about fertilizing materials to use, how much to use, and how and when to apply. What is best will depend on the soil type, what the soil tests show, the rotations used, and the cropping systems followed.

If, for example, phosphate is needed, rock phosphate or one of the soluble phosphates, or both, may be used, depending on conditions. Rock phosphate, since it is applied in rather large amounts, does not need to be used as often as the soluble phosphates. It should be put on the field ahead of the legumes in the rotation. Probably not less than 1,000 pounds should be used to the acre. The application of one of the soluble phosphates to wheat, barley, and rye at the time of planting, even on land where rock phosphate has been applied, appears to be good practice.

When such soils as Tama, Muscatine, Alexis, Littleton, and Orio silt loam show the need for phosphate, rock phosphate can be used to advantage if it is applied ahead of clover or alfalfa. On Harpster, Sable, Beaucoup, Sawmill, Hersman, and Hartsburg it is questionable whether rock phosphate will increase the yields enough to pay for its cost. On these soils it is necessary to use a rotation that will maintain the supplies of nitrogen and organic matter. A soluble fertilizer should be applied for wheat, and a fertilizer such as 0-9-27 for corn, particularly when grown on Harpster.

The role and importance of phosphate is explained in Illinois Bulletin 484, "The Problem of Phosphate Fertilizers."

Protect against erosion. Suggestions for controlling erosion on specific soil types are given in Table 3, page 11. They are also discussed on pages 18 to 38 in the paragraphs on use and management whenever a type needs such protection.

Even on moderately sloping land, the long-time effects of soil erosion must be given serious consideration. On types with gentle slopes the right rotations will cut soil losses to a minimum. Some soils in Cass county, however, are too steep to be cultivated unless they are farmed on the contour and are protected by grass waterways or, in some cases, by terracing. Certain other soils are best used for permanent pasture or for hay crops or kept permanently in forest cover.

Detailed directions for controlling erosion will be found in Farmers' Bulletin 1795, "Conserving Corn-Belt Soils," published by the U. S. Department of Agriculture, Washington, D. C., and in Illinois Circular 513, "Save the Soil with Contour Farming and Terracing."

Checking wind erosion. The sandy soils of Cass county are very easily eroded by the wind. The effect of uncontrolled wind erosion on one of these sandy soils is shown in Fig. 7, page 26.

Shelterbelts and reforestation will check the action of the wind. Information on suitable kinds of trees and methods of planting them can be obtained by writing the FORESTRY DEPARTMENT, AGRICULTURAL EXPERIMENT STATION, *Urbana, Illinois.*

Other measures should be used to supplement the shelterbelts. The most effective are strip-cropping, leaving the surface rough, leaving crop residues on the surface, and using a cover crop.

Sandy soils are a special problem. Since the total acreage of sandy soils in Cass county is large, it is important to know how best to care for them. Crop yields may be limited by the physical condition of these soils as well as by shortages of plant foods. As there is considerable variation among these soils, it is not possible to give general suggestions for farming them.

A guide to the treatment of one of these soils, Hagener loamy sand, is found in the results obtained on the Oquawka soil experiment field in Henderson county, which is located on a similar type. Manure alone does not give satisfactory returns. The best treatments are manure plus limestone, and residues plus limestone. Rock phosphate used in addition to limestone or to manure has not increased yields. Potash now seems to be essential, tho this was not true until the last three or four years.

Frequent legume crops, especially alfalfa, are needed on sandy soils because of the nitrogen and organic matter they furnish. A reserve of these two materials cannot, however, be maintained on these soils, which are so open that organic matter decays too rapidly and nitrogen leaches away.

Experience shows that some species of pine trees do well on sandy soils. This use of sandy soils in Cass county should be given consideration. (See Fig. 9, page 26.)

Minor elements sometimes limit crop yields. Besides nitrogen, phosphorus, and potassium there are other elements that may at times limit crop yields. This is particularly true on the sandy soils in Cass county. Calcium, magnesium, and boron are the most common minor elements that are likely to need attention. Calcium and magnesium can be supplied in dolomitic limestone. For information about boron write to the DEPARTMENT OF AGRONOMY, AGRICULTURAL EXPERIMENT STATION, *Urbana, Illinois.*

Main points to remember. For those farming the better soils in Cass county, there are some practices that can be briefly summarized. *First,* make every effort to maintain and improve the soil by a systematic program of cropping and fertilizing. *Second,* apply soil treatments that will produce a vigorous growth of clovers. *Third,* manage the soil in such a way as to cut down soil losses on slopes.

Many bottomland clay soils in Cass county are subject to overflow and are difficult and expensive to drain. Timber is an excellent crop for these undrained bottoms. Cottonwood, silver maple, elm, and sycamore are the principal species to use.

Know Specific Problems of Your Soils

After having identified the soil types that occur on your farm and having noted the general recommendations for good soil management just given, the next step is to read the descriptions of your soils and study carefully the recommendations for their cropping and management. This information will be found somewhere on pages 18 to 38. Summarized information about all types is given in Table 3, page 11, and Table 5, page 17.

With this information you will be able to find any weaknesses in your present management and lay out a program of improvement. Obviously you will have to make your own plans since they will

necessarily be based on the way the land has been cropped and managed in the past and on your future desires, as well as on your soil types.

One great obstacle to the proper use of farmland in Cass county is the custom of laying out fields in straight lines. In the rolling parts of the county this practice must be changed if the land is to remain permanently productive. Many fields, especially in the rolling areas, contain two or more soils that call for widely different management and different kinds of crops. When the area of one of the types is very small it often is necessary to farm it in the same way as the major type or types. But often the areas of the different types are large enough so that rotations can be split or boundaries of fields rearranged so as to allow each type to be devoted to its best permanent use.

Table 4. — CASS COUNTY SOILS: Areas of the Different Types

Type No.	Type name	Area in square miles	Area in acres	Percent of total area
17	Berwick silt loam	2.84	1 820	.75
18	Clinton silt loam	32.77	20 970	8.64
19-35	Sylvan silt loam, Hamburg silt loam, undifferentiated	54.73	35 030	14.41
28	Jules silt loam, bottom	8.13	5 200	2.14
30	Hamburg very fine sandy loam	6.80	4 350	1.79
34-35	Tallula silt loam, Hamburg silt loam, undifferentiated	14.94	9 560	3.94
36	Tama silt loam	20.35	13 020	5.36
39	Oakford silt loam, terrace	13.15	8 420	3.47
41	Muscatine silt loam	31.03	19 860	8.18
45	Denny silt loam	.06	40	.02
53	Plainfield fine sand, rolling phase	8.28	5 300	2.18
54	Plainfield sand, terrace	20.55	13 150	5.42
61	Atterberry silt loam	4.37	2 800	1.15
67	Harpster clay loam, terrace	.16	100	.04
68	Sable silty clay	19.96	12 770	5.26
71	Beaucoup clay, bottom	11.79	7 550	3.11
73	Huntsville loam, bottom	3.87	2 480	1.02
78	Arenzville silt loam, bottom	13.22	8 460	3.48
80	Alexis silt loam, terrace	.20	130	.05
81	Littleton silt loam, terrace	11.53	7 380	3.14
83	Sawmill clay, bottom	33.37	21 360	8.78
87	Sumner sandy loam, terrace	6.75	4 320	1.78
88	Hagener loamy sand, terrace	12.53	8 020	3.30
103	Muck	.93	590	.25
125	Selma loam, terrace	3.11	1 990	.82
136	Brooklyn silt loam, terrace	1.17	750	.31
177	Orio silt loam, terrace	1.03	660	.27
184	Clinton fine sandy loam	1.37	880	.36
186	Sylvan fine sandy loam	1.97	1 260	.52
187	Brooklyn sandy loam, terrace	1.66	1 060	.44
188	Beardstown loam, terrace	2.13	1 360	.56
195	Hersman clay loam, terrace	11.06	7 080	2.91
200	Orio sandy loam, terrace	2.36	1 510	.62
201	Selma sandy loam, terrace	.56	360	.15
202	Biggs sandy loam, terrace	1.92	1 230	.51
203	Kilbourne loamy sand, terrace	1.51	970	.40
244	Hartsburg silty clay	6.67	4 270	1.76
	Pond	10.65	6 820	2.81
	Total	379.48	242 880	100.00

Table 5. — CASS COUNTY SOILS: Summary of Characteristics

Type No.	Type name	See page[a]	Topography[b]	Permeability of subsoil[c]	Organic matter	W
17	Berwick silt loam	18	Very gently sloping	Slow	Low	
18	Clinton silt loam	18	Gently to moderately sloping	Moderate	Low	
19	Sylvan silt loam	19	Strongly sloping	Moderate	Low	
28	Jules silt loam	20	Nearly level	Moderate	Low	
30	Hamburg very fine sandy loam	20	Steep	Rapid to moderate	Low	
34	Tallula silt loam	21	Moderately to strongly sloping	Moderate	Low to medium	
35	Hamburg silt loam rolling phase	21	Moderately to strongly sloping	Rapid to moderate	Low	
36	Tama silt loam	23	Moderately sloping	Moderate	Medium	
39	Oakford silt loam	23	Very gently sloping	Moderate	Medium to high	
41	Muscatine silt loam	24	Very gently to gently sloping	Moderate	Medium to high	
45	Denny silt loam	24	Depressional	Slow	Medium	
53	Plainfield fine sand rolling phase	25	Moderately sloping	Rapid	Low	
54	Plainfield sand	26	Very gently sloping	Rapid	Low	
61	Atterberry silt loam	27	Nearly level to gently sloping	Moderate	Medium	
67	Harpster clay loam	27	Nearly level	Moderate	Medium to high	
68	Sable silty clay	28	Nearly level	Moderate	High	
71	Beaucoup clay	28	Nearly level	Slow to moderate	Medium	
73	Huntsville loam	29	Nearly level	Moderate	Medium to high	
78	Arenzville silt loam	29	Nearly level	Moderate	Low	
80	Alexis silt loam	30	Moderately sloping	Moderate	Medium	
81	Littleton silt loam	30	Gently sloping	Moderate	Medium to high	
83	Sawmill clay	30	Nearly level	Slow to moderate	High	
87	Sumner sandy loam	31	Gently sloping	Rapid to moderate	Low	
88	Hagener loamy sand	31	Gently sloping	Rapid	Low	
103	Muck	32	Depressional	Moderate	Very high	
125	Selma loam	33	Nearly level	Moderate	High	
136	Brooklyn silt loam	33	Nearly level to depressional	Slow	Low to medium	
177	Orio silt loam	34	Nearly level	Moderate to slow	Medium	
184	Clinton fine sandy loam	34	Gently sloping	Moderate	Low	
186	Sylvan fine sandy loam	35	Strongly sloping	Rapid to moderate	Low	
187	Brooklyn sandy loam	35	Level to depressional	Slow	Medium to low	
188	Beardstown loam	35	Gently sloping	Moderate	Low to medium	
195	Hersman clay loam	36	Level to depressional	Moderate	High	
200	Orio sandy loam	36	Level to depressional	Slow	Medium	
201	Selma sandy loam	37	Nearly level	Moderate	High	
202	Biggs sandy loam	37	Nearly level	Moderate to rapid	Low to medium	
203	Kilbourne loamy sand	37	Level to depressional	Moderate to rapid	Very low	
244	Hartsburg silty clay	38	Nearly level	Moderate	High	

[a] For descriptions of soil types turn to pages indicated.
[b] Topography is expressed by the following terms: *depressional*, nearly level, less than .5 percent slope; *very gently slopin*
moderately sloping, 3.5 to 7 percent; *strongly sloping*, 7 to 15 percent; *steep*, greater than 15 percent.
[c] Of the terms used, *moderate* expresses the most desirable drainage.
[d] Workability is dependent on texture, organic-matter content, and structure of the surface horizon, as well as on slope and dr
[e] *Tendency to erode* means susceptibility to water erosion when cultivated. Wind erosion is indicated only where it is a hazard.

SOIL TYPES OF CASS COUNTY, THEIR USE AND MANAGEMENT

Berwick silt loam (17)

Berwick silt loam is a light-colored soil which has developed from deep deposits of loess, a wind-blown silt. It is found in the nearly level upland areas once covered by a heavy stand of mixed hardwood forest. These areas usually have a slope of ½ to 1½ percent.

Soil profile. Where it is cultivated, this soil to plow depth is a gray silt loam with a brownish cast. The soil granules are so weak that the soil tends to pack and crust easily during rains. The subsurface, which extends to a depth of about 18 inches, is a light-gray ashy silt loam with a yellowish cast. The subsoil extends on to a depth of about 36 inches. It is a yellowish-gray clay loam, plastic, and medium-compact, and water penetrates it only slowly. Below the subsoil the material ranges from a silty clay loam to a silt loam. Free lime is found at depths varying from about 50 to about 80 inches.

Use and management. Berwick silt loam underdrains slowly. It can be drained best by open ditches and furrows. Because it is gently sloping, erosion control is not a serious problem. Where it has not been cultivated, it is neutral or very slightly acid in the surface layer. After years of cropping, however, many areas are now too acid to grow good clover. They should be tested for acidity and limestone applied as needed.

Most crops will give satisfactory yields on Berwick silt loam after it has been treated with large amounts of animal or green manure, but small grains do best. To get the highest yields of wheat or barley, a soluble phosphate or a mixed fertilizer high in phosphate must be drilled with the seed.

Clinton silt loam (18)

Clinton silt loam is an upland soil developed from deep loess, a silty windblown deposit, under a mixed hardwood forest vegetation. It is usually found on slopes ranging from about 2 to 5 percent. This is an extensive type in Cass county, occupying almot 21,000 acres.

Soil profile. When undisturbed, the surface 2 to 3 inches of this soil is a grayish-brown silt loam. The subsurface is a yellowish-gray silt loam. The subsoil, which starts at a depth of 15 to 18 inches, varies from a grayish-yellow to a yellow silty clay loam. The subsoil is moderately permeable to water. Below 60 to 90 inches free lime is found.

Use and management. The surface drainage and underdrainage of Clinton silt loam are fair to good. Tho not naturally a "strong" soil, in the sense that high crop yields can be maintained under poor farming, crops on Clinton silt loam respond well to good soil treatment.

On much of this type, sheet and gully erosion are serious problems. Since any system of management that will control erosion must produce a vigorous growth of vegetation, the fertilizer needs of this soil must be given first attention.

Tho this type is not always acid, it often is. Acidity tests should therefore be made and limestone applied as needed. Next a rotation should be adopted that includes a high percentage of deep-rooting legumes or clover mixtures and a low percentage of row crops. A typical

rotation of this kind would be corn, oats, wheat, clover, and clover. Soybeans should not be grown on any but the most level areas, since they leave the soil so loose that it erodes easily.

Clovers and small grains such as wheat and barley need generous amounts of available phosphate. Phosphate should therefore be applied when soil tests show it to be low. Potash is not likely to limit crop yields in the near future.

The kinds of crop rotation and soil treatment suggested above will give some protection from erosion, but other measures to control erosion should be used where possible. Fields should be cultivated on the contour, and grassed waterways should be provided to carry off surplus water. Often the arrangement of fields can be altered to make contour cultivation more feasible. Terracing should prove of value when safe outlets can be secured. Diversion terraces will often be useful in preventing gullies from cutting back into fields from adjacent steep slopes.

Sylvan silt loam and Hamburg silt loam undifferentiated (19-35)

Sylvan silt loam (19) and Hamburg silt loam (35) are upland types which have been weathered from loess, a silty windblown deposit. Together they occupy 35,000 acres in Cass county, or more than 14 percent of the county. They occur in such narrow strips and in such close association that it is not possible to show them separately on a small map. Both are found on strongly rolling land in areas once covered by mixed hardwood forests. The slopes on which they occur range from 10 to 25 percent.

Soil profile. The surface of Sylvan silt loam is a dark yellowish-gray silt loam 2 to 4 inches thick. The subsurface is also a silt loam but it is more yellowish than the surface. The subsoil is heavier, being a yellow heavy silt loam or silty clay loam. It is permeable to water. Where there has been no erosion, the surface is 7 to 12 inches thick and the subsoil 12 to 24 inches thick. Free lime is usually found below 30 to 35 inches. In cultivated areas the surface has usually been removed by erosion, and in many places the subsoil also has been lost, exposing the calcareous (limey) loess that lies below.

It is this unleached loess that forms the Hamburg silt loam. Free lime is present in the surface of this type despite some slight evidence of weathering. The color varies from a yellowish-gray to gray. The texture is that of a coarse silt or silt loam, and there is little or no change with depth. This soil is known locally as "'ground-hog' or 'gopher' dirt."

Small outcrops of a buried soil that is only slowly permeable to water sometimes occur on the lower parts of the longer slopes.

Use and management. Because of their steep slopes and tendency to erode, these two soils are better for pasture or meadow than for growing grain. Short slopes, less than 10 rods long, may sometimes be cultivated if they are not too steep. Lime is sometimes needed on Sylvan silt loam, but Hamburg silt loam contains an abundance of lime. Legumes usually do well on Sylvan, but on Hamburg, manure is sometimes needed to establish clovers.

If the Sylvan-Hamburg complex is to be cultivated, steps must be taken to guard against sheet and gully erosion. These steps include good cropping practices and the use of grassed waterways,

contour cultivation, and strip cropping, and in some cases terraces.

Even when the land is kept in pasture or meadow, serious gullies can develop within a few years if the land is overgrazed or if a path is started up and down the slope. Gullies neglected for a year or two grow so deep they cannot be crossed with farm implements. A few years later they are likely to be beyond control, cutting back into cultivable fields on the ridge tops. Gullies 20 to 40 feet deep are not uncommon.

Gullied slopes can be worked down and planted to black locust if control measures are started while the gullies are small and if surface runoff can be diverted away from the gullies for a few years. Such plantings will be as effective as any vegetation in bringing the gully under control.

The steeper portions of the slopes may well be left in timber, and they should be protected from grazing. An area already badly cut by gullies should be fenced off to prevent grazing. The gullies can then be planted to black locust and the land allowed to return to timber.

For information on gully control and on the planting of black locust write for Circular 593, "Grass or Gullies," and Circular 567, "Forest Planting on Illinois Farms." For further information on reforestation, write the Experiment Station, specifying the soil type or types concerned.

Jules silt loam, bottom (28)

Jules silt loam is a light-colored soil found in the bottoms. It has developed from limey sediments washed down from the adjacent hills. The total area in Cass county is 5,200 acres.

Soil profile. The surface of this type is a yellowish-gray to yellow silt, containing free lime. The calcareous (limey) deposit ranges from about 2 feet to 15 feet or more in thickness. The soil is very permeable to water, but it is subject to rather frequent overflow and many areas are inclined to be wet.

Use and management. Portions of Jules silt loam are so frequently flooded that their best use is for pasture or timber production. Where the overflow is not too frequent and the water drains off quickly, this soil is well adapted to cultivation.

So far as is known, this type will give good crops of corn if clover is grown to supply nitrogen. Lime is not needed, since the soil contains plenty of free lime.

Phosphate should be applied only on a trial basis. Soluble phosphates should be used. Rock phosphate is not very effective on soils that contain a good supply of free lime.

Hamburg very fine sandy loam (30)

Hamburg very fine sandy loam is a light-colored soil that has developed on very steep areas where the slope varies from about 30 to 100 percent (45 degrees). The native vegetation was bluestem, with scattered trees in sheltered coves. This soil is found on the bluffs overlooking Illinois and Sangamon rivers, where it occupies a total area of 4,350 acres. The general appearance of these bluffs is shown in Fig. 1, page 3.

Soil profile. The surface layer consists of an inch or two of very fine sandy loam or coarse silt, which is brown and highly calcareous (limey). This layer may

A good pasture on Hamburg very fine sandy loam, found on the bluffs overlooking Illinois and Sangamon rivers. Even tho this pasture has some very steep slopes — up to 75 percent — it gives no evidence of increasing erosion. It has been grazed moderately. Fig. 5

sometimes be lacking because of erosion. The rest of the material is a buff or yellow friable very fine sandy loam or coarse silt. It also is highly calcareous, containing numerous lime concretions and snail shells.

Use and management. Hamburg very fine sandy loam is a pasture type. It is not suited to cultivation because of its very steep slopes. No soil treatment is suggested, altho the quality and yield of the pasture might at times be improved by a scattering of clover seed. Care should be used to prevent overgrazing. More forage can be grown if the land is grazed for two or three weeks and then rested for four to six weeks than if it is grazed continuously. A steep slope (75 percent) which has been moderately grazed is shown in Fig. 5. The slope has a good cover and shows no evidence of erosion.

Tallula silt loam and Hamburg silt loam undifferentiated (34-35)

Tallula silt loam (34) and Hamburg silt loam (35) are upland types that have been weathered from loess, a silty wind-blown deposit. They usually occur in such narrow strips and in such close association that it is not possible to show them on a small map. Both are found on strongly rolling land in areas formerly covered by native grasses. The slopes range from 4 to 20 percent. Mixed areas of these two types occupy about 9,500 acres in Cass county.

Soil profile. The surface layer of Tallula silt loam is 6 to 8 inches thick, brown to yellowish-brown, and friable. The subsurface, which extends to a depth of 15 to 20 inches, is a brownish-yellow silt loam. No true subsoil has developed in this type. The subsurface rests directly on the calcareous (limey) loess, which may be stained with organic matter to a depth of 25 or 30 inches. Below this depth the loess is a yellow to yellowish-gray silt with frequent lime concretions.

This alfalfa pasture on Tallula silt loam, a rolling upland type, is an example of good land use. Supplying palatable, nutritious feed, it also provides complete protection against erosion, a problem on the steep slopes where this soil type occurs. Fig. 6

Hamburg silt loam (35) may be thought of as Tallula silt loam with the surface soil removed. Erosion has exposed the calcareous loess that lies below. Thus free lime is present in the surface of Hamburg, tho there is slight evidence of weathering in some places. The color varies from yellow to yellowish gray, and the texture is that of a coarse silt or silt loam, little or no change occurring with increasing depth. Hamburg silt loam is known locally as " 'ground-hog' or 'gopher' dirt."

Use and management. Because they occur on steep slopes, both Tallula silt loam and Hamburg silt loam erode rapidly when cultivated. Sole reliance should not, therefore, be placed on crop rotation for controlling erosion. Contour cultivation and grass waterways are also needed, and terraces should be used if good outlets can be established.

These soils are best used for pasture or meadow. The best rotations for cultivated areas are those in which meadow crops are common. A rotation consisting of corn, oats, wheat, alfalfa, alfalfa, alfalfa, supplemented by contour cultivation, grass waterways, and terraces, should go far toward preventing destructive erosion. Clovers seeded alone without grasses are not so effective as grass-legume mixtures. Timothy, bromegrass, or other grasses should normally be seeded with the alfalfa or the clover.

Gullies form quickly in these soils. Care must therefore be taken to prevent their start. If terraces are built, they must be well maintained, for if they are allowed to break over, deep gullies may form as the result of a single rain.

Little is known about the fertilizer requirements of these soils. Light applications of lime may at times be needed on Tallula silt loam, but Hamburg silt loam requires no lime. Soil tests should be used to determine the lime requirements of Tallula.

Nitrogen and organic matter are low. Frequent legumes are needed in the rotation. The need for phosphate and pot-

ash should be determined by soil tests followed by trial applications on small areas. Soluble phosphates should be used, since rock phosphate is not very effective on calcareous (limey) soils. Manure may at times be the best fertilizer to use to get clovers established on Hamburg silt loam.

Tama silt loam (36)

Tama silt loam is a dark upland prairie soil found on slopes ranging in steepness from about 3 to 6 percent. The total area of Tama silt loam in Cass county is about 13,000 acres.

Soil profile. The surface of this type is a brown silt loam 5 to 8 inches thick. The subsurface is light brown to brownish yellow and extends to a depth of 12 to 18 inches. The subsoil is brownish-yellow silty clay loam permeable to water. Below about 36 inches is a friable yellow silt loam, and below 50 to 60 inches carbonates are usually found.

Use and management. Tama silt loam is a good general farming soil, but because of its rolling character it is subject to moderate sheet and gully erosion. Except on the longer slopes (slopes of more than 10 rods) erosion can be controlled fairly well by the use of lime and a good rotation. On the longer slopes contour cultivation and grass waterways are also needed. After lime has been applied, a rotation should be adopted which keeps a growing crop on the land as much of the time as possible. A rotation such as corn, oats, and clover or the four-field system explained on pages 10 to 13 is suitable. Soybeans should not be grown because of their tendency to leave this soil in a loose, erodible condition.

To get the best yields, phosphate may at times need to be applied. Tests should be made to determine how much is needed. The best form to use depends on the crops to be grown, soluble phosphates being better for wheat. Potash is not likely to limit yields of most crops for a number of years.

Oakford silt loam, terrace (39)

Oakford silt loam is a dark soil found near the foot of the bluffs along Illinois and Sangamon rivers. It has developed under a grass vegetation on materials washed down from the bluffs. The slopes are gradual (only ½ to 1½ percent). The total area of the type in Cass county is 8,420 acres.

Soil profile. The surface is a brown friable silt loam 6 to 10 inches thick. The subsurface is a brownish-yellow friable silt loam, resting at a depth of 15 to 30 inches on silty calcareous (limey) bluff wash. Normally there is no subsoil development, weathering having gone on for too short a time for this layer to have formed. Near the bluffs the texture of this type approaches that of a very fine sandy loam.

Use and management. Oakford silt loam is an excellent general farming soil. Drainage is very good. No serious erosion problem exists, altho areas are frequently crossed by deep ditches. Sweet clover or alfalfa will grow after only moderate applications of limestone. It takes little more than a crop of clover every fourth year to produce high yields of other crops for many years.

Applications of phosphate or potash may be desirable at times for special crops or for very high yields, but the soil should be tested before these elements are applied as a regular farm practice.

Muscatine silt loam (41)

Muscatine silt loam is a dark upland soil found on the smoother areas in association with Tama silt loam and Sable silty clay. It usually occurs on areas where the slope is about 1 to about 3 percent. It is one of the more extensive upland types in Cass county, occupying almost 20,000 acres, or 8 percent of the area of the county.

Soil profile. The surface is a brown or dark-brown heavy silt loam 8 to 10 inches thick and only weakly granular. The subsurface is a silt loam varying from a yellowish brown to brown. The subsoil begins at a depth of 16 to 20 inches. It is a grayish-yellow silty clay loam or silty clay with brown coatings. The entire profile absorbs water readily. Carbonates (free lime) usually occur below 40 to 50 inches. In some small areas which are entirely surrounded by Hartsburg silty clay (244) the free lime begins at 20 to 35 inches and the soil is somewhat lighter colored thruout.

Use and management. Muscatine silt loam is one of the better general farming soils. All grain crops suited to the region do well on it. Basic soil treatment includes the use of limestone in amounts indicated by soil tests to be needed and the growing of a deep-rooted legume once every three to five years. A fair supply of available nitrogen can be maintained by turning under sweet clover as a green manure every third or fourth year or by using a clover mixture for hay or pasture every fourth year and applying manure.

Applications of phosphate, other than for wheat, should be made only when soil tests indicate a need. The use of manure or deep-rooted legumes will often postpone the need for phosphate for some years to come.

Potash is not expected to become deficient in Muscatine silt loam for a number of years.

Denny silt loam (45)

Denny silt loam is a grayish soil found in small depressions near drainage ways in association with Muscatine silt loam (41) and Sable silty clay (68). It is of very limited extent in Cass county, only 40 acres being shown on the soil map. Many other areas are too small to be shown.

Soil profile. The surface of this type is a grayish-brown silt loam 7 to 9 inches thick. The subsurface is a dull-gray silt loam. The subsoil, which starts at a depth of 15 to 20 inches, is a plastic clay, slowly permeable to water, gray in color, and mottled with brown and yellow.

Use and management. Denny silt loam is acid and low in available plant nutrients. The value of treatment is limited by the difficulty of getting good drainage. Tile do not draw readily unless the surface water can be made to pass directly into them.

Because of their small size, areas of Denny silt loam should usually be handled in the same way as the surrounding soils except as to drainage. Crop yields on Denny are, however, somewhat lower than on the soils associated with it: Muscatine silt loam (41) and Sable silty clay (68).

Plainfield fine sand, rolling phase (53)

Plainfield fine sand, rolling phase, occurs in the upland as a broken belt along the bluffs. It was formed from wind-blown sands when timber, chiefly black oak, grew here. The slopes on which this soil is found range in steepness from 4 or 5 percent to about 30 percent, but most of them are not over 10 percent.

The total area of this rolling phase of Plainfield fine sand in Cass county is about 5,300 acres. Occasional small areas of Sylvan fine sandy loam (186) are included with this type.

Soil profile. The surface inch or two in virgin areas is dark because of the accumulation of leaf mold. Under cultivation this dark surface quickly disappears, and the color becomes yellowish gray. The texture of the surface ranges from a medium to a fine sand.

The subsurface at a depth of 8 to 10 inches is a yellow fine sand. Between depths of 2 to 8 feet there is loose sand. Below the sand is usually a zone of reddish-brown banded clay and iron accumulation.

Use and management. Plainfield fine sand, rolling phase, is acid, very low in plant nutrients, and does not hold water well. The wind causes it to drift.

Because of its drouthiness, this is not a good soil for most grain and pasture crops. However, the very early grains, such as rye, and very drouth-resistant crops, such as melons, cantaloupes, cowpeas, sweet potatoes, and alfalfa, do fairly well. Very early sweet corn, if fertilized, will often produce a fair crop before dry weather sets in.

One of the difficulties in handling this soil is its tendency to drift. Drifting may be lessened or prevented by using shelterbelts and reforesting blowouts and unproductive knolls, by keeping a protective cover of vegetation on the soil as much of the time as possible, and by leaving the surface rough. Turning under organic matter also helps, but this must be done often since there is no way to build up a reserve supply of it in this open, leachy soil.

Cowpeas furnish fairly large amounts of organic matter. Where rye has been grown, they can be drilled in following the binder. Limestone should be applied as needed. Other fertilizers should be applied directly to the crop which they are intended to benefit. Mixed fertilizers high in potash, such as 0-9-27 or 0-10-20, should be drilled with small grains on an experimental basis before they are applied as a regular farm practice. If a legume does not precede the grain crop, nitrogen is likely to be deficient, and a fertilizer containing nitrogen, such as 3-12-12 or 4-10-6, should be used.

Alfalfa can be grown successfully if the soil is limed and manured and if a fertilizer such as 0-12-12 or 0-20-20 is applied. Turning under a stand of green sweet clover often insures against failure of the alfalfa to catch.

A crop on sandy land should be cultivated as little as possible, and cultivation should be as shallow as possible. Cultivation does not conserve moisture except by killing weeds.

Experience in Cass county and in other counties in the state indicates that pine trees do well on sandy soils. Red, white, and jack pine have been found especially well adapted to sandy lands. Information about how best to establish a pine plantation may be had from the DEPARTMENT OF FORESTRY, UNIVERSITY OF ILLINOIS, Urbana. Information about shelterbelts can be had from the same source.

Plainfield sand, terrace (54)

Plainfield sand is found mainly on the sandy terraces along Illinois river. This sand was deposited in glacial times during the melting of the ice, when the present terrace area was under water. Some of the sand was reworked by the wind into dunes. The natural vegetation under which this soil developed was a

Blowouts on Plainfield sand. Blowouts like this, caused by the wind, are quite common on sandy soils. It is much easier to prevent such erosion than to reclaim the land later. About 30,800 acres in Cass county are subject to this kind of damage. Fig. 7

Plainfield sand grows fair crops of melons, sweet potatoes, rye, and alfalfa. Corn rarely produces a crop. Fig. 8

Ten-year-old pitch pine on Plainfield sand. White, red, jack, and shortleaf pine are just as desirable as pitch. Fig. 9

hardwood forest, the dominant species being black oak, with a scattering of red oak and an occasional tree of some other species. The slopes vary from 1 to 3 percent, altho there are a few dunes with slopes ranging up to 6 or 7 percent. The total area of Plainfield sand in Cass county is about 13,000 acres.

Soil profile. The surface is a medium sand, stained brownish by leaf mold in undisturbed areas. Under cultivation this color soon disappears, leaving a yellowish-gray, loose, medium sand. Blowouts (Fig. 7) are common in this type.

The subsurface starts at a depth of 8 to 10 inches. It is a yellow sand, very slightly cemented when dry. Between depths of 15 to 70 inches there is loose sand. Below this, sand is usually a banded reddish-brown accumulation of clay and iron.

Use and management. Suggestions just made for Plainfield fine sand, rolling phase, apply also to this terrace type. However, because this type has a coarser texture, it does not hold water so well, and yields of summer crops are somewhat lower. Wheat and corn are not likely to give satisfactory yields in any but the most favorable seasons. A good field of watermelons is shown in Fig. 8 and a ten-year growth of pitch pine in Fig. 9. White, red, jack, and shortleaf pine are equally desirable.

Atterberry silt loam (61)

Atterberry silt loam is a medium-dark soil which occurs in the upland. It forms a belt of varying width between forest and prairie soils. It is found on areas which have slopes of 1 to 3 percent. The forests probably covered these areas for too short a time to destroy the characteristics which the prairie vegetation gave it. It occupies about 2,800 acres in Cass county.

Soil profile. Atterberry silt loam is intermediate in character between Muscatine silt loam (41) and Berwick silt loam (17). The surface soil is a brownish-gray to grayish-brown silt loam 6 to 8 inches thick. The subsurface is a gray to brownish-gray silt loam. The subsoil, which starts at a depth of 18 to 20 inches, is a brownish-yellow slightly plastic silty clay loam or silty clay. Calcareous (limey) loess is found at depths of 45 to 70 inches.

Use and management. Atterberry silt loam might be considered as a lightly forested Muscatine silt loam (41). Altho it is somewhat less productive than Muscatine, the suggestions made for managing Muscatine, page 24, apply equally well to Atterberry. The only difference is that on Atterberry organic matter should be added more often.

Harpster clay loam, terrace (67)

Harpster clay loam is a dark soil which, in Cass county, is found in the lower-lying portions of the Illinois river terraces. It occurs chiefly in association with Selma loam (125). Many areas are too small to be shown on the soil map. Their presence may be recognized, however, by fragments of snail shells in the surface soil, for this type was formerly covered by shallow intermittent lakes. This is not an extensive type. Something more than 100 acres are shown on the map and there are many other areas too small to be shown.

Soil profile. The surface, which is 5 to 10 inches thick, is a very dark gray or

black clay loam or sandy clay loam. It usually contains many fragments of snail shells. The subsurface is a dark yellowish-gray clay loam, frequently grading into a subsoil of yellow mottled sandy clay.

Use and management. Tile draw readily in this soil if outlets are available. The condition commonly limiting corn and soybean yields is a shortage of potash. The soil has plenty of lime, and is usually well supplied with nitrogen and phosphate, but available potash is likely to be low. The supply of potash should be determined by test before corn is planted, and applications made as needed. Straw and coarse manure are also useful in helping to correct the potash deficiency.

Since small grains are likely to lodge on this soil, they should not be seeded oftener than necessary. When wheat is grown, applications of about 150 pounds of 0-14-7 or 0-20-10 fertilizer may be of value.

Sable silty clay (68)

Sable silty clay is a dark soil found on the upland. It occurs in depressions or on nearly level areas (areas with less than 1 percent of slope). It has developed from loess (a silty wind-blown deposit) under poor natural drainage and a grass vegetation. It occupies about 13,000 acres in Cass county.

Soil profile. The surface of this type is a well-granulated black silty clay or silty clay loam about 10 inches thick. It is high in organic matter and plant nutrients, and is either sweet or at most only slightly acid. The subsurface is a very dark-gray silty clay. The subsoil, beginning at a depth of 15 to 18 inches, is a gray silty clay mottled with yellow. Below about 40 inches the material contains free lime.

Use and management. Sable silty clay is a highly productive soil when well drained. It needs only occasional light applications of lime and a good rotation to grow high yields of the common grain crops. Clover every fourth year is the best means of keeping this soil in a high state of productivity.

Crops are not likely to respond to applications of potash, altho a soluble phosphate or a mixed fertilizer should benefit wheat.

Tests on the Hartsburg soil experiment field in Logan county suggest methods for handling the heavy portions of this type. For a report of these tests write to the AGRICULTURAL EXPERIMENT STATION, Urbana, Illinois.

Beaucoup clay, bottom (71)

Beaucoup clay is a medium-dark soil found in the low areas of the flood plain along Illinois river. The areas of this soil usually have a slope of less than ½ percent. The total area of Beaucoup clay in Cass county is 7,550 acres.

Soil profile. The surface of this type is a very dark gray to grayish-brown plastic clay 10 to 15 inches thick. Below the surface there is a gray to dark-gray clay mottled with yellow or rusty brown. The material becomes lighter in color with depth, but the texture continues heavy. Beaucoup clay differs from Sawmill clay (83) in the color of the surface, Sawmill being darker. The boundary between the two types, however, is not

sharp; the change in color is gradual and takes place over considerable distance.

Use and management. Beaucoup clay is naturally poorly drained and can seldom be cultivated without flood protection and artificial drainage. Drainage can best be provided by levees and open ditches. Lime is needed only on occasional small areas, for the soil is seldom acid. Because of its heavy texture and low content of organic matter, this soil is hard to work. Sweet clover should be grown every three or four years to add fresh organic matter and help preserve the tilth. Plowing ordinarily should be done in the fall, so that freezing and thawing can break down the clods. Care must be taken not to work this soil when wet, for clods are easily formed and hard to break down.

Beaucoup clay is well supplied with phosphorus and potash. Fertilizers are not needed, altho light applications made at planting time will give a crop an early start. Before fertilizers are applied as a regular farm practice, trial applications should be made for several years.

This is a good soil for corn, soybeans, and wheat. Spring grains do not often do well because they are usually seeded too late for best yields.

Huntsville loam, bottom (73)

Huntsville loam is a dark soil that has been derived from sediments recently deposited by Illinois river. It is a minor type in Cass county, occupying only 2,500 acres.

Soil profile. The surface is usually a brown loam, altho it varies from a silt loam to a sandy clay. The deeper layers also vary in texture. These differences in texture in each layer are common in sediments recently laid down by running water. The underlying material is usually of medium texture and is not acid.

Use and management. Little of the Huntsville loam in Cass county is protected from overflow, and on most areas crops are too uncertain to justify their being planted. Where areas are high enough, the soil is well adapted to corn and soybeans. No soil treatment is needed, as fresh deposits of sediment are left from year to year by floodwaters.

Arenzville silt loam, bottom (78)

Arenzville silt loam is a light-colored soil found along the bottoms of the small streams. It has been formed from sediments recently deposited on dark bottomland soils. The total area of this soil in Cass county is 8,500 acres.

Soil profile. The surface of this type varies from a brownish-yellow to a yellowish-gray silt loam. It is normally sweet, and many small areas contain free lime. The thickness of this light-colored surface layer varies from about 15 inches to several feet. The soils buried under the surface layer vary from a dark-brown silt loam to a black silty clay loam. In a few small areas the light-colored surface layer is missing.

Use and management. Arenzville silt loam is subject to overflows of rather short duration. Floodwaters rise rapidly but usually recede after a few hours.

Many of the bottoms are so narrow or irregular in shape that they can probably be best used for pasture or left in timber. However, where the soil is tillable, corn is a good crop. No soil treatment is advised, as fresh sediments are added during periods of overflow.

Alexis silt loam, terrace (80)

Alexis silt loam is a dark soil. It occurs on the more rolling portions of the terraces along Illinois river, where the slopes range from about 3 to 5 percent. It is a minor type in Cass county, occupying only 130 acres. It occurs in association with Littleton silt loam (81) and Hersman clay loam (195) but differs from those types as a result of having developed under conditions which provided more rapid drainage.

Soil profile. The surface is a light-brown to brown silt loam 4 to 7 inches thick. The subsurface is a brownish-yellow silt loam. The subsoil begins at a depth of 12 to 18 inches and varies from a light brownish-yellow silty clay loam to a heavy silt loam.

Use and management. Alexis silt loam is very similar to Tama silt loam (36) and can be used and managed in the same way. See page 23.

Littleton silt loam, terrace (81)

Littleton silt loam is a dark soil occurring on the silty terraces along Illinois and Sangamon rivers. The native vegetation was grass. The slope of the areas where this soil is found ranges from about ½ to 1½ percent. Littleton occupies about 7,400 acres in Cass county.

Littleton silt loam occurs in association with two other terrace soils, Alexis silt loam (80) and Hersman clay loam (195). It differs from those types as the result of having developed under different drainage conditions. Littleton has more rapid natural drainage than Hersman but slower drainage than Alexis.

Soil profile. The surface is a brown to dark-brown silt loam 6 to 8 inches thick. The subsurface is a yellowish-brown silt loam. The subsoil begins at a depth of 15 to 18 inches and is a brownish-yellow silty clay loam. Below 35 inches the material becomes friable, but carbonates (free lime) are seldom present at less than 60 to 80 inches.

Use and management. Littleton silt loam is very similar to Muscatine silt loam (41). The suggestions made for the use and management of Muscatine (see page 24) apply equally well to Littleton.

Sawmill clay, bottom (83)

Sawmill clay is a dark soil found in depressions or on nearly level areas of the flood plains of Illinois and Sangamon rivers. It has developed from sediments deposited by back water or by very slowly moving water. The total area of Sawmill clay in Cass county is 21,400 acres.

This type is similar to Beaucoup clay, differing from it in having a darker surface. The separation between the two types is not, however, a sharp one, and the transition belt between them is frequently very broad.

Soil profile. The surface of Sawmill clay is a black or very dark grayish-brown plastic clay 10 to 15 inches thick. Below the surface the material is a dark-gray clay mottled with yellow or rusty brown.

Use and management. Because it contains more organic matter, Sawmill clay is slightly easier to handle than Beaucoup clay. The two types are, however, very similar and the suggestions made for the use and management of Beaucoup, pages 28-29, apply equally well to Sawmill.

Many areas in the heavy bottomlands of Cass county are swampy. These may be used for timber production while in an undrained condition. Cottonwood, silver maple, elm, and sycamore are the main species to grow in these bottoms.

Sumner sandy loam, terrace (87)

Sumner sandy loam is a medium-dark soil found thruout the sandy terraces along Illinois and Sangamon rivers. It occurs on areas with slopes of 1 to 3 percent. It covers a total of 4,300 acres in Cass county.

Soil profile. The surface of this type varies in color from brown to light brown, and in texture from a loamy sand to a sandy loam. The subsurface is often heavier and darker than the surface. The subsoil, which begins at a depth of 20 to 25 inches, is a yellow sandy clay loam. In many small areas, however, no zone of clay is to be found in the subsoil. Below 35 to 40 inches there is usually loose sand.

Use and management. Sumner sandy loam is moderately acid. It is rather low in organic matter and does not hold water well. Erosion is not a serious problem, altho the surface is subject to some drifting by the wind.

The prime needs of this soil are limestone and organic matter. Lime should be applied in such amounts as soil tests indicate are needed. A rotation should be adopted that will make use of sweet clover as a green-manure crop. Drouth-resistant crops such as alfalfa, and small grains which mature ahead of hot dry weather, should make up the major part of the rotation. Such a rotation would be corn, soybeans, rye, clover, wheat, and alfalfa (alfalfa to occupy the land for three years).

Phosphate and potash fertilizers should be used only on a trial basis until need for them has been demonstrated. Soluble phosphates usually give worthwhile increases in the yields of wheat. Clovers and alfalfa respond to rock or soluble phosphates.

Hagener loamy sand, terrace (88)

Hagener loamy sand is found in association with Plainfield sand but differs from it in having a darker surface, the result of once having been covered with prairie grasses. It is found on nearly level areas to gentle slopes ranging from 1 to 3 percent. A few small areas of dark sand with slopes ranging up to 7 percent were mapped with this type. The total area of Hagener loamy sand in Cass county is slightly over 8,000 acres.

Soil profile. The surface is a light-brown loamy sand 20 to 40 inches thick. Below this, to a depth of 6 or 8 feet, there is loose, incoherent yellow sand, which in turn is underlain by a zone of banded clay and iron accumulation.

Use and management. Hagener loamy sand is acid, low in plant nutrients, and does not hold water well. It is also subject to wind erosion. Because of its drouthiness, it is poorly adapted to summer grain crops such as corn and soybeans. It is, however, a good soil for early small grains, such as rye and wheat, or drouth-resistant crops, such as melons, cowpeas, sweet potatoes, and alfalfa. A field of sweet potatoes growing on Hagener loamy sand is shown in Fig. 10. Very early sweet corn will, if fertilized, often produce a fair crop before dry weather sets in.

To prevent the movement of sand by the wind three things are needed: fre-

quent shelterbelts, vegetation that will keep the soil covered as much of the year as possible, and the working of large amounts of fresh organic matter into the soil.

Experiments show that after limestone and organic matter have been supplied to sandy soils, lack of potash soon limits crop growth, especially legumes. Muriate of potash or a mixed fertilizer high in potash, such as 0-9-27 or 0-10-20, is likely to be worth while for sweet clover, alfalfa, and other legume crops. The Oquawka experiment field, located on sandy soil similar to Hagener loamy sand, does not show any increase in the yields of corn, soybeans, rye, wheat, clover, or alfalfa as the result of applying rock phosphate where limestone and manure or limestone and residues are used.

Sweet potatoes grow well on Hagener loamy sand, which is found on the terraces. Some of the very sandy soils of Cass county will not grow good field corn but will give fair yields of sweet corn, early small grains such as rye and wheat, melons, cowpeas, and alfalfa.
Fig. 10

Muck (103)

Muck is found in scattered areas thruout the Illinois river bottoms in abandoned channels and oxbows. The total area covered by this type is almost 600 acres.

Soil profile. Muck consists of the black partially decomposed remnants of native sedges and grasses mixed with mineral soil particles. Below 20 to 40 inches brown peat is usually found.

Use and management. The first need of this type is drainage, which is best furnished by open ditches. Muck does not make a good bed for tile; the tiles get out of line and fail to carry off the water efficiently.

After drainage has been provided, potash fertilizer will cause very marked increases in crop yields. If properly fertilized, muck will produce good crops of corn and vegetables. Since potash is usually the limiting element, mixed fertilizers high in potash, such as 0-9-27 or 0-10-20, are suggested for this soil. Or, if obtainable, potash alone may be used.

Selma loam, terrace (125)

Selma loam is a dark soil found in low-lying areas thruout the sandy terraces along Illinois river. It developed under a covering of swamp grass on areas with slopes of 1 percent or less. It occupies almost 2,000 acres in Cass county.

Soil profile. The surface layer, which extends to a depth of 8 or 10 inches, is a black or dark grayish-brown loam or sandy clay loam. The subsurface is a dark-gray sandy clay loam. Scattered areas are found in which there is a sandy clay subsoil starting at 20 to 24 inches, but as a rule no zone of clay is present. Below 35 to 40 inches the material usually becomes rather sandy.

Many alkali spots occur in Selma loam, but the areas are often too small to be shown on the map. For a discussion of these areas, see Harpster clay loam (67), pages 27-28.

Use and management. Selma loam is moderately high in organic matter and in nitrogen, and is usually sweet. The most common conditions limiting crop yields are poor drainage and a shortage of potash. Tile draw readily. After drainage has been cared for, tests should be made to determine the need for limestone. Since there are alkali spots in this soil, lime should not be applied unless soil tests show a definite need. A crop of sweet clover should be grown and plowed under once every three or four years to maintain a supply of actively decomposing organic matter. Tests should be made for available potash. If the supply is low, potash should be applied for corn, either in the form of straw, strawy manure, or potash fertilizer.

Phosphate is not likely to limit the yields of most crops on this soil, altho applications of superphosphate may be justified on wheat.

Brooklyn silt loam, terrace (136)

Brooklyn silt loam is a medium-dark soil found in shallow depressions on the terraces along Illinois and Sangamon rivers. It occurs in association with Littleton silt loam. It has developed under a grass vegetation from old bluff wash. It is not an extensive type in Cass county, occupying only 750 acres, but its recognition is important because of its slow underdrainage.

Soil profile. The surface is a brownish-gray friable silt loam 5 to 7 inches thick. The subsurface, which extends to a depth of 18 to 24 inches, is a gray to light-gray ashy silt loam. The subsoil is a compact and plastic clay, very slowly permeable to water, and gray with pale yellow mottlings.

Use and management. Brooklyn silt loam is acid and low in plant nutrients, but the chief problem in its management is drainage. Tile do no good unless an inlet is installed to let the surface water pass directly into the tile. Since this type usually occurs in depressions that have no surface outlet, drainage by surface ditches is often impractical.

If drainage can be provided by open ditches or tile, limestone should be applied, and frequent applications of stable manure or green manure should be made to supply nitrogen. The amounts of available phosphate and potash are small. These two elements will need to be added unless fairly heavy applications of barnyard manure can be made.

Orio silt loam, terrace (177)

Orio silt loam is a dark soil found on nearly level areas on the terraces along Illinois river. It occupies 660 acres in Cass county.

Soil profile. The surface 6 to 8 inches is a brown silt loam with a gray cast when dry. The subsurface is brownish-gray silt loam. In some places the lower part of the subsurface is ashy. The subsoil, which begins at a depth of 18 to 20 inches, is a gray medium-plastic clay mottled with brown and yellow. It is slowly permeable to water. The underlying material is usually silty.

Orio silt loam is similar to Brooklyn silt loam (136) but is more permeable to water and has a somewhat darker surface.

Use and management. Orio silt loam, when drained, is moderately productive. Drainage is naturally slow and needs to be supplemented by surface ditches. Tile draw very slowly. If they are used, the laterals should be placed close together. After drainage is established, this soil should be tested for acidity and lime applied as needed. Then a rotation should be adopted which has a fairly high percentage of clover, such as corn, soybeans, oats (seeded to Hubam), wheat, and clover. Wheat and soybeans are better adapted to this soil than corn.

After the nitrogen needs of the crops have been taken care of by a rotation with plenty of legumes, tests should be made to determine whether phosphate and potash are also needed.

Clinton fine sandy loam (184)

Clinton fine sandy loam is a light-colored upland soil found near the bluffs along the Illinois and Sangamon river bottoms. This soil has developed from a coarse loess under a hardwood forest. The slopes on which Clinton fine sandy loam are found range from about 1 to 3 percent. The total area of this type in Cass county is 880 acres.

Soil profile. The surface of this type varies from a yellowish-gray fine sandy loam to a loamy fine sand 6 to 8 inches thick. In virgin areas the surface inch or two is usually stained with mold. The subsurface is a yellowish-gray fine sandy loam. The subsoil begins at a depth of 18 to 24 inches. It is a yellowish-gray fine sandy clay loam. Below 35 to 40 inches the material is loose, but free lime is seldom found above 80 or 90 inches.

Many small areas mapped with this type differ from it in that they have a layer of fine sand at a depth of 20 to 30 inches instead of the normal sandy clay subsoil. Because they are so small, it was not possible to show these areas on the map.

Use and management. Altho Clinton fine sandy loam is more drouthy and less productive than Clinton silt loam, the two types call for very similar treatment and are adapted to the same crops. The suggestions made for the use and management of Clinton silt loam, page 18, apply also to this fine sandy loam. As a rule, however, erosion is less serious on the fine sandy loam than on the silt loam and it can be controlled by a good rotation supplemented by grass waterways.

Sylvan fine sandy loam (186)

Sylvan fine sandy loam is a light-colored soil found on the upland close to the bluffs along the Illinois and Sangamon river bottoms. It has developed from a coarse loess, a wind-blown silty deposit, mixed with some fine sand. The natural vegetation was a mixed hardwood forest. The slopes on which this soil is usually found vary from 7 to 25 percent. The total area of Sylvan fine sandy loam in Cass county is about 1,260 acres.

Soil profile. The surface of this type varies from a yellowish-gray loamy fine sand to fine sandy loam 5 to 7 inches thick. The subsurface is a grayish-yellow loamy fine sand or fine sandy loam. The subsoil, which begins at depths ranging from 15 to 25 inches, is a reddish-yellow fine sandy clay loam. Free lime is seldom found closer to the surface than 80 or 90 inches.

Small areas scattered thru this type do not have the fine sandy clay loam subsoil described above. These areas are too small to be shown on the map.

Use and management. This soil is not well adapted to cultivation because of its steep slopes and low water-holding capacity. Where lime is applied and the slopes are not too steep, alfalfa does fairly well. In general, however, this soil is best suited for pasture or timber.

Brooklyn sandy loam, terrace (187)

Brooklyn sandy loam is a medium-dark soil found in depressional areas scattered thruout the sandy terraces along Illinois and Sangamon rivers. It has developed from old river deposits under a grass vegetation. It occupies about 1,060 acres in Cass county.

Soil profile. The surface of this type is a brownish-gray sandy loam 5 to 7 inches thick. The subsurface is a light-gray loamy sand. The subsoil, which begins at depths of 18 to 24 inches, is a sandy gray clay with yellow or rusty-brown mottlings. It is compact and plastic. Water moves thru it very slowly. Below 36 to 40 inches the material is usually sandy. Small areas are occasionally found in which the sandy clay subsoil is thin or even absent.

Use and management. Poor drainage frequently limits crop yields on Brooklyn sandy loam. Because of the slow movement of water thru the subsoil, chief reliance for drainage must be placed on open ditches and furrows.

This soil is acid. Once drainage is established, it should be tested for acidity and limestone applied as needed. A rotation which includes a high proportion of legumes and the least amount of corn should be followed. Such a rotation would be corn, soybeans, oats, wheat, and clover. Since both phosphate and potash are likely to be low on this soil, tests should be made to determine to what extent they are needed. In general, where the soil tests low, the best results can be expected from mixed fertilizers applied at seeding time.

Beardstown loam, terrace (188)

Beardstown loam is a medium-dark soil found on the older alluvial deposits along Illinois river. It occurs on areas with slopes of ½ to 1½ percent and occupies a total area of 1,360 acres in Cass county.

Soil profile. The surface of this type is a grayish-brown loam 7 to 9 inches thick. The subsurface is a brownish-gray loam. The subsoil, which begins at a depth of 18 to 20 inches, is a gray or yellowish-gray sandy clay loam very heavily mottled with yellow and rusty brown. Below 40 inches the material usually becomes increasingly sandy.

Use and management. Beardstown loam has moderate surface drainage, which can usually be easily improved by surface ditches. Underdrainage is probably somewhat slow.

Tests should be made to determine the need of this soil for lime. After the acidity has been corrected, a rotation should be adopted that makes liberal use of sweet clover as a green manure.

Little is known about the response which crops on this soil make to applications of phosphate or potash. The use of these fertilizers should be guided by the results of soil tests and by observing how crops respond over a period of years. This will give a double check on the value of these fertilizers on this soil.

Hersman clay loam, terrace (195)

Hersman clay loam is a dark soil found in many of the deeper depressional areas on the terraces along Illinois and Sangamon rivers. It occurs in association with Littleton silt loam (81) and Alexis silt loam (80) but differs from them as a result of poorer natural drainage. This soil was formed under a swamp-grass vegetation from fine-textured sediments. It occupies about 7,100 acres in Cass county.

Because of its low-lying position, this type is subject to flooding, especially after heavy rains, when the small streams coming from the upland overflow their banks. It grades gradually into Sawmill clay, the boundary between the two being difficult to determine.

Soil profile. The surface varies from a granular black clay loam to a silty clay 8 to 10 inches thick. It is high in organic matter and plant nutrients and is usually sweet. The subsurface is a brownish-gray or very dark-gray clay loam. The subsoil, which begins at a depth of 15 to 18 inches, is a gray clay loam mottled with pale yellow.

Use and management. Hersman clay loam is very similar to Beaucoup clay (71), and can be used and managed in the same way (see pages 28-29).

Orio sandy loam, terrace (200)

Orio sandy loam is a dark soil found in depressions scattered thruout the sandy terraces along Illinois and Sangamon rivers. It has developed under a grass vegetation from an old sandy river deposit. The total area in Cass county is about 1,500 acres.

Soil profile. The surface is a grayish-brown to dark grayish-brown sandy loam 6 to 8 inches thick. The subsurface varies from a dark-gray to a gray sandy loam. The subsoil begins at a depth of 18 to 24 inches. It is a gray sandy clay heavily mottled with yellow and only slowly permeable to water. Below 35 to 40 inches the material is usually sandy. In small spots the sandy clay subsoil is absent or very thin.

Use and management. This soil is similar in its physical properties to Orio silt loam (177) and can be used and managed in the same way (see page 34).

Selma sandy loam, terrace (201)

Selma sandy loam is a dark soil found in a few of the depressional areas in the sandy terraces along Illinois river. It is a minor type, covering only 360 acres in Cass county.

Soil profile. The surface is a black sandy loam 6 to 8 inches thick. The upper part of the subsurface is a dark-gray sandy loam; but as the depth increases, the color gradually becomes lighter and the texture sandier until at 35 to 40 inches a gray sand is reached.

Use and management. Selma sandy loam is not usually acid, but most areas, because of their low-lying position, are too poorly drained to be cultivated. After drainage is provided, this soil needs mainly a potash fertilizer and an occasional legume crop to provide nitrogen.

Biggs sandy loam, terrace (202)

Biggs sandy loam is a medium-dark soil found in depressions thruout the sandy terraces along Illinois river. It has developed under a swamp-grass vegetation from old, very sandy deposits. The total area of this type in Cass county is 1,230 acres.

Soil profile. The surface is a grayish-brown to dark grayish-brown sandy loam 6 to 8 inches thick. The subsurface is a dark-gray loamy sand, becoming lighter in color and texture with increasing depth, until a gray sand is reached at about 20 inches. No zone of clay is ordinarily present, altho in small spots there are thin zones of a sandy clay.

Use and management. Biggs sandy loam is moderately low in organic matter, it is acid, and does not hold water well. Altho a certain amount of drainage must be provided, this soil will become very drouthy if the water table is lowered too much.

This soil should be tested for acidity and lime applied as needed. A rotation should then be adopted in which drouth-resistant crops predominate. Corn, soybeans, oats (seeded to Hubam), wheat, and clover would be such a rotation. Tests should be made for potash and phosphate, and these fertilizers applied in soluble form at seeding time.

Kilbourne loamy sand, terrace (203)

Kilbourne loamy sand is a light-colored soil found in depressions thruout the sandy terraces along Illinois river. It differs from Plainfield sand (54) as a result of poorer natural drainage. It has developed under a forest vegetation from very sandy material deposited by water. It is not an extensive type, covering only 970 acres in Cass county.

Soil profile. The surface is a gray to brownish-gray loamy sand 6 to 8 inches thick. The subsurface is a light-gray sand. This sand continues down without change to depths of more than 40 inches.

Use and management. Because it does not hold water well and is low in plant nutrients, Kilbourne loamy sand is a poor soil to cultivate. It is likely in most years to be either too wet or too dry. Probably its best use is for pasture or timber.

Hartsburg silty clay (244)

Hartsburg silty clay is a dark soil found on nearly level or depressional areas in the uplands of Cass county. It has developed under a grass vegetation and under a high water table. These two conditions have greatly retarded the leaching out of plant foods. The area covered by Hartsburg silty clay in Cass county is about 4,300 acres. Numerous small areas of Sable silty clay (68) are present in areas of Hartsburg silty clay.

Corn and soybeans grow well on Hartsburg silty clay, as these thrifty fields show. This type is found in the upland of Cass county and is one of the better soils. Barnyard manure or green manure crops turned under will supply the nitrogen it needs. Fig. 11

Soil profile. The surface of this type varies from a very dark gray to a dark grayish-brown silty clay. It is neutral in reaction and often contains concretions, or nodules, of lime. The subsurface is a dark-gray silty clay. The subsoil, which begins at a depth of 15 to 18 inches, is a gray silty clay weakly mottled with yellow. Lime concretions are usually found at depths of 20 to 35 inches.

Use and management. Hartsburg silty clay is one of the better soils in Cass county, as the height of the soybeans shown in Fig. 11 suggests. Its principal need seems to be for nitrogen, which can be supplied either by barnyard manure or by turning under green legume crops. Applications of phosphate and potash are not likely to give large increases except on wheat. These two materials should be applied only on a trial basis before being used as a regular practice.

Some of the long-time results from the Virginia soil experiment field located on Hartsburg silty clay in Cass county, show what this soil will do under different fertilizer treatments. Twenty-three crops of open-pollinated corn grown in a rotation of corn, oats, and clover without soil treatment averaged 61 bushels an acre. Manure increased the yields to 68 bushels. Where lime was used in addition to manure there was a small reduction to 66 bushels; but where manure, lime, and bone phosphate were used, yields advanced to 72 bushels. Potash had no effect on this crop. Oats, without soil treatment, yielded 48 bushels. Manure increased the yield to 51 bushels, but lime used in addition to manure cut it to 47 bushels.

HOW CASS COUNTY SOILS WERE FORMED

Knowledge of the way in which the soils on his farm originated may not be a necessary part of a farmer's information, but it is an interesting part. Because the authors believe there are many who would like to have a brief outline of these processes, this section is included in this report.

Origin of soil materials. The nature of Cass county soils and the way in which they are distributed are the result of two things: the nature of the parent materials and the conditions under which these soils later developed. The upland and the terrace soils are derived from materials that were laid down during and immediately following the times when great glaciers reached this area. Some of the terrace materials have probably been reworked by both wind and water since the earlier period. The bottomland soils were formed from sediment deposited in fairly recent times.

During the millions of years known as the Glacial Epoch the climate alternated between long periods when it was much like our climate today and other periods of prolonged cold. In the colder periods the average temperature was so low that the snow which fell in winter did not entirely melt in the following summer. Enormous amounts of snow and ice eventually piled up in the northern parts of our continent. The pressures developed in this great ice mass caused it to move outward, forming glaciers. This movement continued until the glaciers reached a region where the climate was warm enough to melt the ice as rapidly as it advanced.

In moving across the country, these sheets of ice picked up masses of rock,

Loess in the making. The upland soils of Cass county owe the productiveness largely to the silty wind-blown material, called *loess*, laid down near the close of the ice age by dust storms like this one. The Illinois river bottom was the source of most of the dust deposited in the region of Cass county. (*This picture was taken in Texas in the spring of 1935 by the U. S. Soil Conservation Service.*) Fig. 12

gravel, sand, silt, and clay, ground them together, and sometimes carried them for hundreds of miles. The moving ice leveled off hills and filled old valleys, often changing completely the features of the surface over which it passed. The deposits of rock material left by the glaciers are known as glacial drift and glacial till,[1] terms which appear frequently in descriptions of soils.

Two of the glacial advances contributed materials to Cass county soils. The *Illinoian ice sheet* covered the entire county. Long after the Illinoian ice disappeared, the Wisconsin ice sheet, the last great ice movement, approached but did not touch any portion of Cass county. This last ice sheet did, however, cover the headwaters of Sangamon and Illinois rivers, and its melting sent tremendous quantities of water draining thru these rivers, depositing sediments along the river bottoms.

The melting of the Wisconsin ice sheet must have taken many centuries. Thruout that period, in addition to yearly temperature changes, the climate alternated between cold and temperate stages. Varying quantities of water must therefore have poured down Illinois and Sangamon rivers. During the colder spells when the melting of the ice was checked, these bottoms presumably became dry mud flats. When these flats were exposed to the action of winds, the fine silt sediments were blown into the air and later deposited on the upland. Fig. 12 shows how a windstorm picks up the "dust" from bare, dry fields. The wind sorts this dust into particles of different size and deposits the sand particles (the larger ones) close by and the silt (which is fine) farther away. The silty deposit, called "loess," contains a considerable amount of carbonates of calcium and magnesium. The depth of this loess in Cass county varies from about 100 feet or more close to the bluffs to about 15 feet in the southeastern part of the county.

After the loess and sand were blown onto the upland, the bluffs eroded, leaving silty material at their base. This material is called "bluff wash" or "bluff outwash."

Illinois and Sangamon rivers, as well as the smaller streams of the county, overflow their banks frequently. Some of the bottom areas are thus still receiving deposits of water-borne sediment.

The soil materials of Cass county can, then, be divided into several groups: (1) upland silt or loess; (2) sands; (3) terrace bluff outwash (silty); (4) bottom and terrace loams and clay loams; and (5) bottom, mostly clay, of recent deposition, chiefly swampy. Fig. 14, page 43, shows the distribution of these various groups of materials in Cass county.

How the soils were developed. As soon as the parent materials from which our soils were derived were laid down, they were subjected to various weathering forces, and the process of soil development began. The effect of weathering varied from place to place because of differences in the parent materials, in the slope of the land surface, the drainage, the type of vegetation, and the activity of all living things — plants, animals, and organisms of microscopic size.

Weathering forces have, of course, been most active near the surface of the soil, decreasing with depth. If carbonates of calcium and magnesium were originally present, as they were in the loess, the percolating waters leached

[1] The Illinois State Geological Survey defines glacial "drift" as all material of glacial origin, whether stratified (sorted into layers of different sized particles) or unstratified and whether deposited by the ice itself or by the glacial waters. "Till" is defined as unstratified drift deposited directly from the ice.

them out of the surface soil first. Minerals have decomposed most extensively near the surface, some being reduced to clay. Wherever organic matter has accumulated, it has been near the surface.

Thus layers, or horizons, with definite characteristics were developed in the soil. The action of the weathering forces on the parent material has gradually given it characteristics which it did not originally possess and it can now be called soil.

As weathering continues, the layers or horizons become more sharply differentiated, and the original characteristics of the parent material may finally be completely obliterated. In soils that have undergone only slight weathering, the parent material keeps much of its original character. In Cass county some of the soils developed from the sands have properties similar to those of the original sand. Most of the soils developed from upland loess are now quite different from the original loess, which may be seen in many deep road cuts.

The kind of vegetation under which the soils of Cass county have developed has influenced markedly the amount of organic matter which they contain. The prairie grasses, thru their extensive fibrous root systems, have added much organic matter to the soil. Marsh vegetation, of which there were once extensive areas on the upland, the bottoms, and the terraces, also has added organic matter.

Forest vegetation, on the other hand, adds little organic matter to the soil. The twigs and leaves lie on the surface, where they oxidize readily. Moreover the roots of trees are coarse and few, and hence do not add much organic matter. In the swampy timber areas on the bottoms the soil has acquired a fair supply of organic matter from the sediments deposited by floodwaters and from the undergrowth, which is preserved by the swamp conditions.

Drainage and the slope of the land surface are responsible for certain other characteristics in a soil. The poorly drained soils in the depressions, where the iron compounds are only slightly oxidized, are gray, tho the color may be masked by the darker organic matter. The soils developed under good drainage, on the other hand, are yellowish or

Soil survey men study a soil profile. The different layers, or "horizons," are exposed by the cut made for a road. Fig. 13

reddish, tho again the color of the surface horizon may be modified by the organic matter present.

In the humid, temperate climate of Illinois, as already pointed out, the effect of the weathering of soil material is the production of horizons, or layers, in the soil. Each horizon has more or less definite characteristics. These horizons are designated as *surface, subsurface,* and *subsoil* in the descriptions.

The *surface* horizon is usually the layer where the greatest amount of

organic matter has accumulated. The *subsurface,* in soils which have not weathered much, is usually a transition between the surface and the subsoil; in soils that have undergone considerable weathering, it may be a bleached gray, low in plant nutrients and organic matter. Clay usually accumulates in the subsoil, making this layer more plastic and sticky than either the surface or the subsurface. Water is likely to move slowly thru this layer. This condition is generally more pronounced in soils that have undergone considerable weathering.

All these zones, or horizons, taken together make up the "soil profile." Differences in the arrangement, color, and thickness of the various zones, or in any other of their physical features or in their chemical content are the bases upon which soil types are differentiated and the soil map constructed. A photograph of a soil profile is shown in Fig. 2, page 5.

GROUPING OF THE SOILS OF CASS COUNTY

Thirty-seven soil types have been separated in Cass county and are shown on the colored map. Some of these soils have important characteristics in common. Each has one or more characteristics which distinguish it from the others. Where, for example, loess is the parent material and prairie vegetation has flourished, topography, or "lay of the land," largely determines which type we have, whether Type 244, 68, 45, 41, 36, 34, 35, or 30. Under timber vegetation, it determines whether we have Type 17, 18, 19, or 35.

Those who need to become familiar with all the soil types in this county will find it helpful to get an understanding of the relations between the different soils. Table 6 and Fig. 14, in addition to Fig. 3 on page 6, will help to make these relations clear.

Principal upland soils. Six of the upland prairie soils furnish an example of related types. All are derived from loess parent material and all originally had a prairie vegetation growing on them.

Muscatine silt loam (41) and Tama silt loam (36), two of the six, occur adjacent to each other. Muscatine, however, has more organic matter than Tama, and its subsoil is grayer. Muscatine occurs on gentle slopes, while Tama usually is found on somewhat stronger slopes.

Further study of the soil map reveals that Sable silty clay (68), Hartsburg silty clay (244), and a complex consisting of Tallula silt loam and Hamburg silt loam, undifferentiated (34-35), occur in the same regions as do Muscatine and Tama. Hartsburg silty clay (244) is found on areas where a high water table during the period of its development caused lime concretions to form close to the surface (Fig. 3, page 6). Where the water table was somewhat lower but still rather close to the surface, the lime concretions formed deeper, and in such situations we have Sable silty clay (68). The vegetation, parent material, and drainage in these two situations were such, however, that both soils developed dark surface and subsurface horizons. In both, the loess parent material has weathered from a silt to a silty clay.

Muscatine and Tama silt loams (41 and 36) were developed on more pronounced slopes than Hartsburg or Sable.

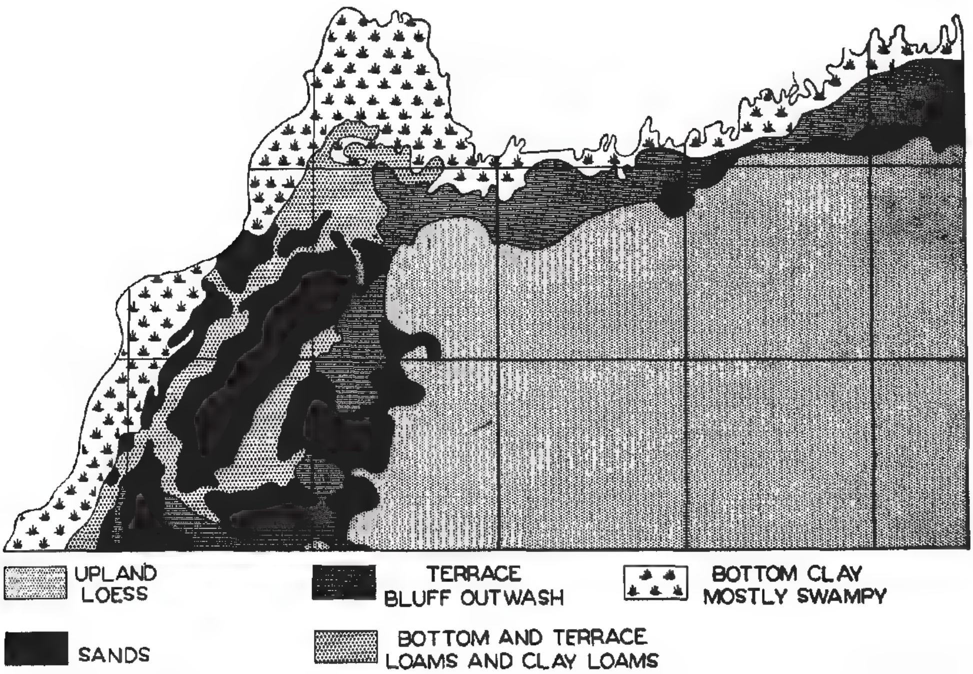
Table 6. — CASS COUNTY SOILS

Grouped According to Parent Materials, Vegetation, and Drainage[a]

Parent materials	Vegetation	TYPES WITH SIMILAR SLOPE AND DRAINAGE DURING PERIOD WHEN FORMED						
		Depressional areas		Slope .5-1.5% Drainage slow	Slope 1.5-3.5% Drainage moderate	Slope 3.5-7% Drainage moder-ately rapid	Slope 7-15% Drainage rapid	Slope 15%+ Drainage very rapid
		High water table	Low water table					
UPLAND SOILS (Type Nos.)								
Loess, silty	Prairie	244, 68	45	..... 41, 61[b]		36, 34-35	34-35	19-35, 30
	Timber	......	......	17, 61[b]	 18	......	19-35	19-35
Loess, sandy	Timber	......	......	......	184	......	 186	......
Sands	Prairie	202	200	......	......	......	......	......
	Timber	......	......	......	......	 53	......	......
TERRACE SOILS (Type Nos.)								
Sands	Prairie	202	......	......	 88	......	......	......
	Timber	203	......	......	 54	......	......	......
Sands mixed with silt and clay	Prairie	201	200	......	87	......	......	......
Silts								
Old bluff wash	Prairie	195	136, 177	81	......	80	......	......
Young bluff wash	Prairie	......	......	39	......	......	......	......
Loams	Prairie	67, 125	187	188	......	......	......	......

[a] Bottomland soils (Types 28, 71, 73, 78, 83, and 103) are not included in this table because they do not fit into any slope or drainage categories. The differences between bottomland types are presumably due to differences in parent materials.

[b] Type 61 is a lightly timbered soil.



Distribution of the parent materials from which the soils of Cass county were derived. By getting a clear picture of the location of these different parent materials it is much easier to understand the relationships among the different soil types. Fig. 14

Natural drainage was therefore more rapid and the carbonates of the loess have been leached out to greater depths. Tallula silt loam developed on still steeper slopes (5 to 15 percent). There is no zone of clay accumulation in this soil, and carbonates are found at very shallow depths (15 to 30 inches).

Differences in drainage and topography explain, in a similar way, the differences found among the upland timber types.

An exceptional upland prairie type. Denny silt loam (45), a soil of minor importance agriculturally, is an example of a type that has not now much in common with the other types among which it is found.

Denny is found in occasional shallow depressions near well-established drainageways in association with the types just discussed. Because of its low-lying position, Denny has received runoff from surrounding areas. In remote times the water table was low, causing more downward movement of water thru this soil than thru any of the associated types. With this more intensive leaching, the profile became more strongly acid, and a greater movement of clay from the surface and subsurface to the subsoil took place. Denny silt loam now has slow or impeded internal drainage because of its dense clay subsoil.

The typical situations in which Denny occurs are shown in Fig. 3 on page 6 and further indicated in Table 6.

Bottomland soils. An orderly arrangement of bottomland soils based on soil characteristics is difficult to make because of the many kinds of parent materials from which they have been derived. They therefore are not included in Table 6.

Terrace soils. Two groups of sandy soils occur on the terraces. These are in addition to the upland sandy soils. One group of sandy terrace soils has a layer of clay, the other does not.

The loams are quite varied as regards parent material, and the relations between them are not entirely clear.

The silts have developed from "old bluff wash" and from "young bluff wash." Oakford silt loam (39) is the only soil type in the "young bluff wash" group that is shown on the map. This soil has been subjected to weathering forces only long enough to have had the lime removed to about 30 inches. The soils derived from the older bluff wash —Types 195, 136, 177, 81, and 80—have undergone more weathering and leaching.

Types 195, 81, and 136 of the terrace soils, it will be noted from Table 6, bear the same relation to each other as do Types 68, 41, and 45 of the upland soils.

GEOGRAPHICAL AND HISTORICAL FEATURES

Physiography and drainage. Cass county consists of (1) bottom and terrace lowlands adjacent to Illinois and Sangamon rivers; (2) the steep bluffs and head-water erosion areas; and (3) the level to gently rolling uplands.

The bottom and terrace lowlands are variable as to drainage. The rolling sandy areas are drained too much, whereas some parts of the lowlands are very swampy and frequently flooded. Some of these lands have good pumping facilities and are protected by levees.

The bluffs and areas of head-water erosion extend from east of Chandlerville to south of Arenzville. Other steep, eroded slopes extend back along the creeks. The runoff of rainfall from these

slopes is very heavy, and unless the surface soil is well protected, soil losses are great. Head-water erosion has cut up the land surface of this part of Cass county, producing narrow, flat areas between steep-sided V-shaped valleys. The soils on these small flat areas frequently have rather impervious subsoils. However, because these areas are small, the excess water can often be drained off by furrows or open ditches to the heads of the natural drainageways. On the nearly level to gently rolling areas around Virginia, Philadelphia, and Ashland, tile systems supplement the poor natural drainage in many places. These systems have proved satisfactory in most areas.

The upland of Cass county lies between 580 and 680 feet above sea level and about 180 to 260 feet above the level of Illinois river. The altitude of Beardstown is 446 feet above sea level, that of Virginia 622 feet.

Climate of Cass county. The humid, temperate climate of Cass county varies greatly between the extremes of winter and summer. At the Rushville weather station a few miles west of Cass county, the highest temperature recorded during the years 1920 thru 1941 was 113° F., the lowest –22° F. The mean annual temperature was 52.9° F. The mean July temperature for the period 1890 to 1941 was 76.9° F.; the mean January temperature for the same period was 26.8° F.

The average date of the last killing frost during 1920-1941 was April 21, and the average date for the earliest in the fall was October 19. Thus the average frost-free season is 180 days. The shortest growing season during these twenty-one years was 138 days in 1925, and the longest was 206 days in 1921. The average growing season gives ample time to mature the crops commonly grown, altho frosts occasionally catch corn and soybeans before they have fully matured.

The annual precipitation (amount of rain, and of snow and sleet in terms of rain) recorded at the Rushville Weather Station during 1920-1941 averaged 36.05 inches, ranging, however, from 27.74 inches in 1936 to 46.85 inches in 1926. The yearly snowfall averaged 19.9 inches.

Of much greater interest to farmers than the annual precipitation is the amount and distribution of rainfall during the growing season. From April thru September the amount has ranged from 14.73 inches in 1922 to 33.12 inches in 1926, averaging 23.0 inches. Rainless periods of 10 to 20 days occur during these months nearly every year. If these rainless periods are preceded by adverse moisture conditions, the effect on the crop may be serious, especially on soils of sandy texture. A rainless period long enough to harm crops growing on the better soils occurs about one year in three.

Important as amount and distribution of rainfall are to crops, their importance is altered by a number of other conditions. Among these other conditions are (1) the temperature of the atmosphere and the amount of evaporation taking place, (2) the capacity of the soil to absorb and retain moisture, and (3) the growth-stage of the crop and the reaction of the crop to drouth. These also must be considered when estimating the needs of a given crop for rain.

Settlement of Cass county. Cass county, bordered on the west by Illinois river and on the north by the Sangamon, lies in the west-central portion of Illinois. Its total area is about 380 square miles. Established in 1837 from the area then known as Morgan county, it received in 1843 enough additional territory to bring it to its present size. Beardstown, the

first town in the area, was organized in 1829 and incorporated as a city in 1849. The county seat was first Virginia, then Beardstown, and finally Virginia.

The first white settlers came to Cass county about 1819 and located in the Indian village of Kickapoo, later named Beardstown after the first white settler. Other settlers soon followed. The population increased rapidly until 1870, when there were nearly 12,000 inhabitants. The 1900 Census reported 17,300 inhabitants. Since that time the population has remained fairly constant at slightly more than 16,000, the last two decades showing a slight decrease (Fig. 15).

The level poorly drained portions of the upland, covered with swamp, were not brought under cultivation as early as the rolling and better drained land. Until levee and drainage districts were established, parts of the bottomlands along Illinois and Sangamon rivers which are now protected were frequently flooded. The reclaiming of some of the bottomland by better methods of pumping and dredging is still going on. Many bottom areas are, however, still too wet and swampy to be used for either crops or pasture but may be used to grow timber. Some feel that these wet bottoms are more useful in their present condition than they would be if protected from overflow.

Transportation facilities within the county are fairly good, altho rail services have been curtailed somewhat in the last few years. Several good paved roads traverse parts of the county. There are also numerous oil roads and gravel roads that furnish all-weather outlets for most farmsteads.

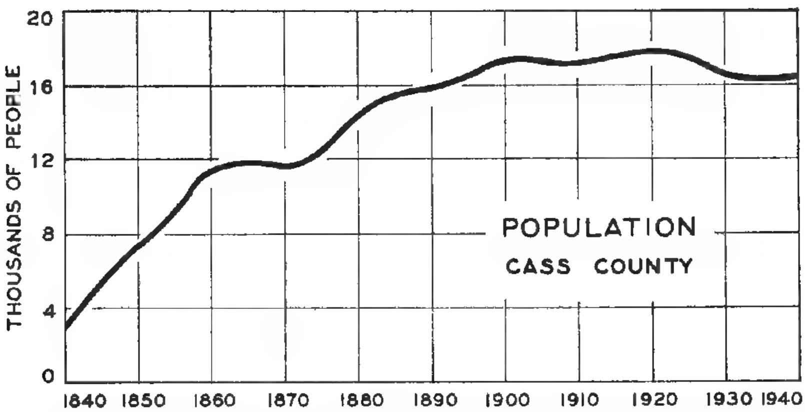
Agricultural production. Cass is essentially an agricultural county. Corn is the major crop, but winter wheat and oats are also important. For the ten years 1930-1939 the average yearly acreage of the chief crops was:

Corn	53,000
Winter wheat	28,000
Oats	15,000
Soybeans (threshed)	10,000+
Rye	4,200
Sweet clover	10,000
Cowpeas	4,500
Alfalfa	2,000

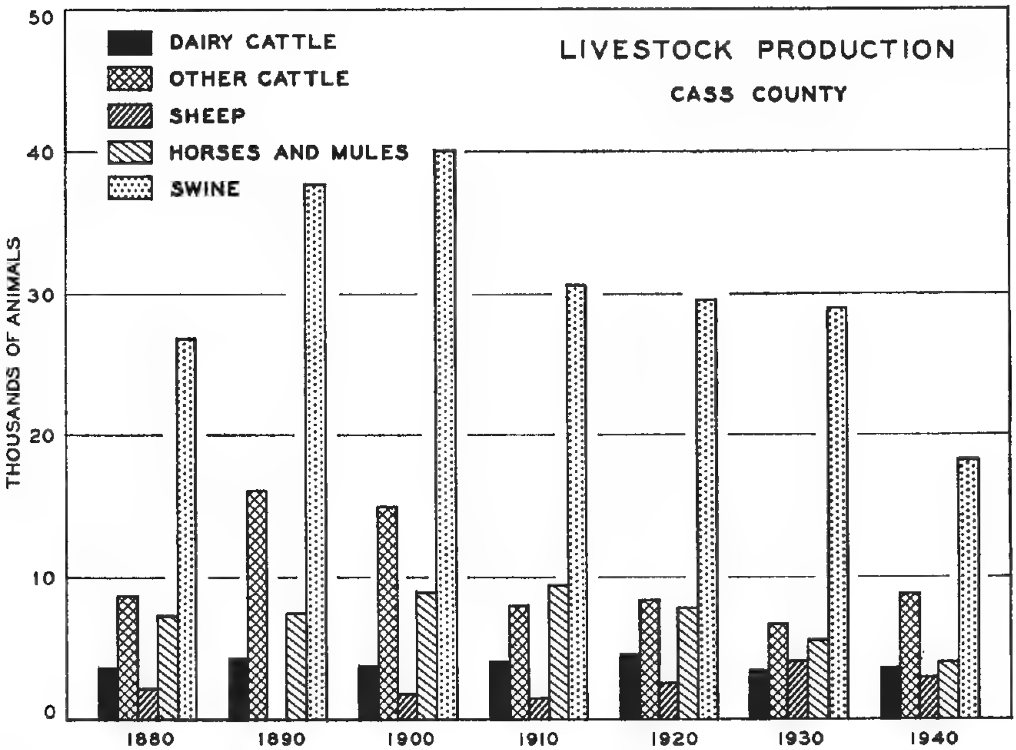
Soybeans have come into prominence in Illinois as a threshed crop. While the 1930-1939 average for this county is only 4,200 acres of soybeans grown for seed, the annual planting for the past few years has exceeded 10,000 acres. Rye and cowpeas are grown mainly on sandy soils. Small acreages of watermelons and cantaloupes, likewise grown on sandy soils, are important sources of income for many farmers.

Only about 120,000 of the 236,000 acres of land in Cass county are used for crops. Because of flooded bottoms, steep bluffland, and sandy areas a considerable portion of the county is not suited to the common crops of the corn belt. According to the U. S. Census of 1939, about 17,000 acres of farmland were then wooded and about 20,000 acres were in plowable pasture.

Livestock has been an important source of farm income in Cass county. Some idea of the trend in livestock production can be gained from Fig. 16, which shows the numbers of cattle, sheep, horses and mules, dairy cattle, and swine in the county at ten-year intervals beginning in 1880. Poultry and egg production have also added substantially to farm incomes.



The number of people in Cass county is now around 16,000. The peak was reached in 1920, when there was a population of about 18,000. In this predominantly agricultural county, a population decline would naturally follow the adoption of modern farming methods. Fig. 15



Livestock production in Cass county reached its peak in the 1890's and the first decade in the 1900's. However, livestock are still an important source of farm income. Dairy cattle have remained at about the same figure since 1880. Fig. 16

SOIL REPORTS PUBLISHED

1 Clay, 1911
2 Moultrie, 1911
3 Hardin, 1912
4 Sangamon, 1912
5 LaSalle, 1913
6 Knox, 1913
7 McDonough, 1913
8 Bond, 1913
9 Lake, 1915
10 McLean, 1915
11 Pike, 1915
12 Winnebago, 1916
13 Kankakee, 1916
14 Tazewell, 1916
15 Edgar, 1917
16 Du Page, 1917
17 Kane, 1917
18 Champaign, 1918
19 Peoria, 1921
20 Bureau, 1921
21 McHenry, 1921
*22 Iroquois, 1922
23 DeKalb, 1922
24 Adams, 1922
*25 Livingston, 1923
26 Grundy, 1924
27 Hancock, 1924
28 Mason, 1924
29 Mercer, 1925
30 Johnson, 1925
31 Rock Island, 1925
32 Randolph, 1925
33 Saline, 1926
34 Marion, 1926
35 Will, 1926
36 Woodford, 1927
37 Lee, 1927
38 Ogle, 1927
39 Logan, 1927
40 Whiteside, 1928
41 Henry, 1928
42 Morgan, 1928
43 Douglas, 1929
44 Coles, 1929
45 Macon, 1929
46 Edwards, 1930
47 Piatt, 1930
48 Effingham, 1931
49 Wayne, 1931
50 Macoupin, 1931
51 Fulton, 1931
52 Fayette, 1932
53 Calhoun, 1932
*54 Ford, 1933
55 Jackson, 1933
56 Schuyler, 1934
57 Clinton, 1936
58 Washington, 1937
59 Marshall, 1937
60 Putnam, 1937
61 Wabash, 1937
62 Vermilion, 1938
63 St. Clair, 1938
64 Stark, 1939
65 Boone, 1939
66 Shelby, 1939
67 DeWitt, 1940
68 Jasper, 1940
69 Cumberland, 1940
70 Warren, 1941
71 Cass, 1947

(No longer available)*

Requests from libraries and other public agencies desiring to complete their files of these reports will be given special consideration.

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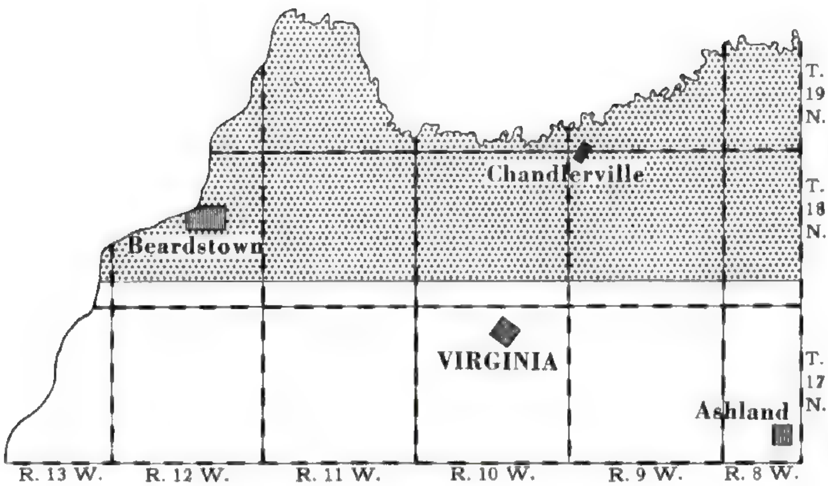
WHAT CROPS WILL GROW BEST ON MY FARM?

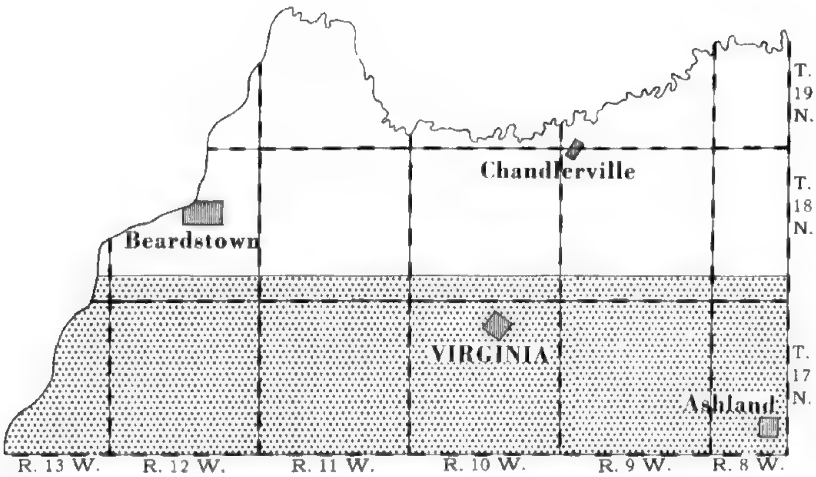
WHAT TREATMENT DOES MY SOIL NEED TO MAKE IT YIELD ITS BEST?

WHAT YIELDS CAN I EXPECT?

These are the questions this Soil Report aims to answer for the farmers and landowners of Cass county. Careful reading will repay all who own or operate farms in this county . . . .



NORTH HALF OF CASS COUNTY



SOUTH HALF OF CASS COUNTY

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Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

(3) email: program.intake@usda.gov.

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SOIL SURVEY MAP OF CASS COUNTY
UNIVERSITY OF ILLINOIS AGRICULTURAL EXPERIMENT STATION
LEGEND
17 Berwick silt loam
18 Clinton silt loam
19-35 Sylvan silt loam, Hamburg silt loam undifferentiated
28 Jules silt loam, bottom
30 Hamburg very fine sandy loam
34-35 Tallula silt loam, Hamburg silt loam undifferentiated
36 Tama silt loam
39 Oakford silt loam, terrace
41 Muscatine silt loam
45 Denny silt loam
53 Plainfield fine sand, rolling phase
54 Plainfield sand, terrace
61 Atterberry silt loam
67 Harpster clay loam, terrace
68 Sable silty clay
71 Beaucoup clay, bottom
73 Huntsville loam, bottom
78 Arenzville silt loam, bottom
80 Alexis silt loam, terrace
81 Littleton silt loam, terrace
83 Sawmill clay, bottom
87 Sumner sandy loam, terrace
88 Hagener loamy sand, terrace
103 Muck
125 Selma loam, terrace
136 Brooklyn silt loam, terrace
177 Orio silt loam, terrace
184 Clinton fine sandy loam
186 Sylvan fine sandy loam
187 Brooklyn sandy loam, terrace
188 Beardstown loam, terrace
195 Hersman clay loam, terrace
200 Orio sandy loam, terrace
201 Selma sandy loam, terrace
202 Biggs sandy loam, terrace
203 Kilbourne loamy sand, terrace
244 Hartsburg silty clay
Scale
0 ¼ ½ 1 2 Miles
1939
R. S. Smith, in charge Soil Survey
Soils Surveyed by
Guy D. Smith, in charge
J. B. Fehrenbacher
F. F. Riecken
E. P. Whiteside
CONVENTIONAL SIGNS
House
School
Church
Cemetery
Elevator
Railroads (steam)
Levee
Paved through routes
Metalled (all weather) roads
Improved dirt roads
Secondary dirt and private roads
Township boundary lines
County boundary lines
Streams (flowing)
Streams (intermittent)
Lake or pond
Swamp
G.P. Gravel Pit
P.S. Pumping Station
B.O. Blow out (sand)
Water features as of Beardstown river stage of 13.4 feet.
NORTH SHEET
R. 12 W.
R. 11 W.
R. 10 W.
R. 9 W.
R. 8 W.
T. 19 N.
T. 18 N.
SCHUYLER COUNTY
MASON COUNTY
MENARD
Beardstown
Chandlerville
Bluff Springs
Newmansville
Clear Lake


LEGEND
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202 Biggs sandy loam, terrace
203 Kilbourne loamy sand, terrace
244 Hartsburg silty clay
SOUTH SHEET
T. 18 N.
T. 17 N.
R. 13 W.
R. 12 W.
R. 11 W.
R. 10 W.
R. 9 W.
R. 8 W.
BROWN
MORGAN
COUNTY
MENARD COUNTY
SANGAMON COUNTY
Virginia
Philadelphia
Hagener
Arenzville
Ashland
La Grange Dam
Meredosia Lake
Scale
0 ¼ ½ 1 2 Miles
1939
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